Public Health Reports

LUME 56 JULY 4, 1941 NUMBER 27

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • JULY 4, 1941 • *No. 27*

A NATIONAL EMERGENCY EXISTS [1]

By WILLIAM P. SHEPARD, M. D., M. A., F. A. P. H. A., *Assistant Secretary* and *Pacific Coast Welfare Director, Metropolitan Life Insurance Company; President, Western Branch, American Public Health Association*

This twelfth annual meeting of the Western Branch, American Public Health Association, convenes amid shadows of war and rumors of war. We are meeting in one of the Nation's most active defense areas. The theme of our program is, "Public Health and National Defense." Regardless of our personal beliefs or political views, we must recognize the fact that the Nation is already launched on the greatest defense program in our history. Preparation for war is on a larger scale and may last for more years than we have ever before experienced. War is all but upon us. We face a serious and common danger.

This is not the time to proclaim the futility of war. If civilization is at fault the remedy must be applied in less troublous times. War may be a biological phenomenon as illogical as nature's waste of seed in procreation. It may be as uncivilized as a street brawl. To discuss these matters here is to waste valuable time on the regrets of yesterday. We are here today to apply the realism so characteristic of public health. Our immediate job is to prepare ourselves for the important work awaiting us now. What the distant future may hold, none can foretell, but war preparations impose some important responsibilities on the public health profession. I propose, therefore, in this brief discussion to suggest an orientation of public health in this chaos of world affairs, to point out certain national defense trends already apparent in public health, and to appraise certain of our present-day public health assets which we shall turn to good advantage in the present emergency.

THE MILITARY VS. CIVILIAN HEALTH

First we must realize that nothing, no matter how important it may seem to us, can interfere with or delay the organization, training, and equipping of the military. Everything that we hold dear may

[1] Read before the annual meeting of the Western Branch, American Public Health Association, San Diego, Calif., May 26, 1941

depend upon our ability to organize quickly and efficiently a superior military machine. This may become our last and most essential defense for the democratic way of life, for our traditions, our homes, and our very existence. Without a winning army and navy we might lose all.

The military must be built up quickly and efficiently by those whose profession it is to do so. Health officers often resent interference from lay people when an emergency professional job is to be done. Let us remember that we civilians are the lay people in relation to the military. Military activity offers little place for that luxury of peace and democracy, "the discussion method." Let us give the military profession no slow or doubtful acquiescence, no interference, nothing but the fullest cooperation.

A healthy civilian population is the source of a healthy military. Strength and health at home are essential to a successful army and navy. Second only then to the prompt organization of an efficient military comes the preservation and improvement of the health of the civilian population. This is an obvious requisite if the Nation is to be successful in defending itself. This responsibility rests squarely on the shoulders of the public health and medical professions and on their colleagues, the teachers and welfare workers. Never does public health become more important than in preparation for war. Good public health work will furnish a continuing supply of able-bodied men to the armies and navies; it will provide a healthy and efficient army of industrial and agricultural workers to produce munitions and materiel; it will develop a healthy and courageous family at home to withstand the anxiety and danger which may be their lot. Poor public health work will diminish the supply of able-bodied soldiers and workers, will allow illness and physical defect to undermine the morale of those at home, and through them, of the Army. Next to military perfection, civilian health is the most important item in national defense.

Despite this importance we may have to expect certain difficulties in attaining our objectives. There are three reasons for this: First, the military comes before everything else; second, there is always some confusion of values when a great peaceful nation is forced to prepare for war; and third, taxation mounts to unprecedented heights.

Among these difficulties may be the necessity of doing more work with less personnel and perhaps with less money. The younger members of the profession, both men and women, will be called to the colors. This means that those who are left, together with what inexperienced new help they can find, must carry on. The burden will fall heaviest on the executives and administrators. They have no escape from meeting their full responsibility and upholding the best of public health standards. This means longer hours, harder

work. It is nothing new for the seasoned public health worker. The cause for which we labor has always justified our utmost efforts.

The necessity of doing more work with less money results from confusion of values and mounting taxes. This is also nothing new to the public health profession. It is an adversary with which we are accustomed to wrestle. During the recent depression we learned some new and effective holds. It simply means that we must be able to show the taxpayer a dollar's worth for every dollar spent. Experiments with new methods designed to cut costs and increase efficiency are especially appropriate. In times of curtailment we must stick to the items in our program which we know will produce results, the kind of results which are convincing to the taxpayer.

It seems clear then that we may expect the military to have first call on the Nation's energies and finances. Knowing our job as we do, we must then leave no stone unturned to teach the Nation that next to the military comes civilian health in national defense. Knowing our limitations as we do, we must be prepared to expect handicaps with which we are already familiar, more work to do, less personnel and less money to do it with. We have proved as recently as the late depression that these handicaps may be overcome.

SOME PUBLIC HEALTH NEEDS IN NATIONAL DEFENSE

Having oriented ourselves with respect to military preparedness, let us now turn to certain trends or changes in direction in our usual public health program which are already becoming apparent and urgent as contributions to national defense.

1. *Correction of physical defects.*—Medical rejection for military service of a large percentage of our young adults again focuses attention on the unmet need for medical care in our population. This is a public health problem of the first magnitude. It challenges the medical and public health professions alike.

It should be pointed out that we understand the reason for these rejections better than we did during the last war. Some would charge failure to medicine and public health for not producing in the past 25 years a higher percentage of physically fit young men. It should be borne in mind, however, that the most effective public health activities in the past have been aimed at reducing mortality, not at producing physical perfection. Our success with the infectious diseases has resulted in preserving a larger proportion of the population to the military age. It should also be kept in mind that Army physical standards, except for teeth, are higher than they were 25 years ago. Since the last war our methods of detecting physical defects have greatly improved. In the last war we were drafting men for combat. Now we are selecting men for defense. There is little basis for comparison in the standards of selection.

If our school health program has failed to correct a high proportion of remediable defects in children, it is largely due to our failure to persuade parents to seek competent medical care. We cannot overlook the fact, however, that our child health work has not produced all the results we expected. There is room for improvement in our methods of finding physical defects as well as in our method of obtaining correction. We have by no means exhausted the possibilities of preventing physical defects and illness through an effective technique of school health education which really produces improved health. Much of our child health program is pioneer work and its effectiveness will improve as we show our ability to get results. Like other pioneer work it has suffered from lack of personnel. Improvement will be noted when we are able to convince school boards that they need more and better school physicians and school nurses.

In any event serious study must be given to supplying the immediate medical needs of about one out of three men called by the Selective Service Boards and found unfit.

2. *Industrial hygiene.*—Thanks to vigorous national leadership in the Public Health Service and in the Army and Navy, we are at last on the verge of an awakening concerning the health of the worker. Men laboring in the essential industries are as important to national defense as are men in uniform. Some men in industry encounter more hazards to life and health than some men in uniform. Regardless of hazards or freedom from hazards, industry offers a fertile ground to apply the well-proved procedures of public health. They are the same as we apply to any population group in order to bring about reduction in preventable illness. These principles are of special value to industry since they mean reduction in lost time due to illness, and lost time means lost money and retarded production.

Responsibility for safeguarding the health of the worker is properly placed first on the State and local health or industrial authorities. It is more important than ever for each health officer to become familiar with the health aspects of working conditions in his locality and to include provision for reasonable health safeguards in his public health code.

3. *Disaster relief.*—One has but to examine the important work of health departments in the presence of local disasters such as flood, fire, and earthquake to appreciate its importance. Disaster may be mitigated by the alert health department to the point where the only lives lost are due to the accidental deaths arising directly from the disaster. On the other hand, disaster may bring a death toll many times greater than the original damage through epidemics or through the neglect of essential health safeguards. This depends almost solely on the efficiency of the local health department. Every city, county, and State health department should have its disaster relief

plans prepared, revised, and rehearsed periodically. Wartime disasters usually come without warning.

4. *Diseases of middle age.*—As the younger age groups depart for military training camps, more work and more economic importance devolves upon the older age groups. Moreover, the proportion of the population over 45 years of age in this country now increases each year. Our progress in prolonging life after age 45 has been slow, yet we know that much can be done to prevent or postpone death from cardiovascular disease, cancer, diabetes, and other so-called degenerative diseases. The techniques of the tuberculosis campaign applied to these increasing causes of death might yield large results under the competent leadership of the medical and public health professions. They assume enhanced importance in times of preparation for war.

5. *Health education.*—The success of the tuberculosis campaign in educating the public has pointed the way to better methods of educating the public in other health matters. This must be done in the schools through our colleagues, the teachers, as well as among the general public. There is still too great a lag between what we can do to prolong life and what we actually do. When the ingredients for good health, such as good medical care, good hospitals, clinics, and competent health departments, are lacking, health education is of little avail. When the ingredients for good health are at our fingertips and not used, it is usually for want of effective methods of health education.

Perhaps the best example of our weakness in health education is in the field of nutrition. In this land of plenty with an average standard of living far exceeding that of any other nation, it is little short of disgraceful that so large a proportion of our people should show evidence of malnutrition. There are groups in this country who lack the means to obtain an adequate and well-balanced diet. There is an appalling number, however, whom we have failed to educate to stir themselves to secure a proper diet. This is one of the most urgent challenges in public health education today. Its urgency is enhanced by the national defense program. We in public health and in teaching shall be found seriously wanting if we do not attack this problem with all the modern methods we possess and without further delay.

Venereal disease control is almost, though not quite, as completely a problem of health education. Its urgency is likewise increased by the need for national defense. It is not solely a problem of health education because it requires certain facilities such as diagnostic centers and treatment clinics before health education can be fully effective. Given these facilities, however, we are then faced with the fact that we fail to control these diseases through missing or faulty health education. The curtain of puritanical bigotry which prevented discussion of these diseases for so long has at last been lifted to admit

the light of scientific fact. No health department will be doing its share towards national defense today until it has employed every modern facility and educational device to combat this scourge of armies and of families.

Finally we must face with our teacher colleagues the fact that we need to help "toughen up America." The next few years may impose physical and nervous strains on our young and old such as we never dreamed human beings would be called upon to withstand. We must share with parents and teachers our scientific knowledge of the remarkable adaptability of the human mechanism. Especially must they know something of what we know concerning physiology and nature's defenses, the surprising reserve of the human mechanism, and its ability to function normally despite distressing external circumstances. We must bring into use our best knowledge of mental hygiene so that these inherent physiological reserves may not be hampered by psychological factors such as fear, insecurity, and frustration. Children of the present generation may have suffered from too much shielding from the unpleasant. Perhaps they needed more understanding and an opportunity to participate with the family group in facing common problems. As medical advisers to parents and teachers, we will be expected to prepare ourselves in this important field of child welfare so that we may render our maximum service to national defense.

So much for these special demands which we may expect the national defense program to present to us. Now let us turn our attention to some of the special and unique assets we in public health possess today with which we may meet these special demands.

PUBLIC HEALTH ADVANTAGES OF TODAY

Public health leadership in this country has always faced reality with an analytical, constructive, and courageous attitude. There is much in our situation today from which to take courage.

1. *National leadership.*—We are blessed to an even greater extent than ever before with strong and able leadership in Washington, D. C. We have in the Surgeon General of the United States Public Health Service and his staff, forceful, articulate, and professional representation. We have splendid leadership in the Children's Bureau. Other and newer Federal agencies show a health consciousness heretofore unparalleled. There is an excellent working relationship between the national official and the national voluntary health agencies. The importance of public health and our needs in all its subdivisions have never been more clearly presented to the Chief Executive and the Congress. The legislative response both nationally and in the States has never been more generous.

2. *Special attention to defense areas.*—Federal supervision of public health in defense areas, which might otherwise be neglected by local

health agencies, will be a stimulus to public health throughout the Nation. It will be a demonstration to local communities of the value of providing themselves with good public health departments. It will set high standards for other areas to follow. It is more than justified in view of the urgency of civilian health in national defense. Health officers of States and in contiguous cities and counties will do well to work closely with Public Health Service men recently assigned to these defense areas. They will thus prepare themselves to continue good work when decentralization takes place and jurisdiction is again returned to local communities. Furthermore, the local health officer is often able to render valuable assistance to Public Health Service and military medical officers. For example, health officers in the San Joaquin Valley are well aware of the dangers of "valley fever" when nonimmune troops are brought into known infected areas for the first time. The Sylvatic Plague Committee of the Western Branch has addressed all western State health officers on a series of conferences held with medical military officers on this distinctive western problem. Tularemia and Rocky Mountain spotted fever may prove troublesome to health authorities.

3. *Young and well-trained personnel.*—Thanks largely to Federal assistance, we have never before had so large a group of young men and women well trained in public health work. Besides good training they bring the vigor and enthusiasm of youth to our cause. Since they will be our mainstays in public health and national defense, it is to these future leaders of our profession that I would address my closing message.

4. *To our future leaders.*—Never lose faith in the cause of public health. It is the most tangible and the most effective of all the great movements for social betterment. It is "the flower, such as it is, of our civilization" with respect to sociological progress. Rooted in the firm ground of medical and sanitary science it meets definite needs in the public health field as well as in the related fields of education, sociology, political science, and statecraft.

The worthiness of this cause has commanded the lifetime energies and engaged the highest abilities of many of the world's greatest men. It has brought forth examples of devotion unsurpassed in other fields of human endeavor. And these examples have likewise come from a large and impressive group of those who were not called "great" in song or history. These are "the unsung great in public health." They comprise the State and local health officers and their loyal assistants of the passing generation. From the standpoint of service to mankind, their claim to greatness is as valid as that of any of their colleagues. Their devotion to the cause of public health is of the same stuff as was the devotion of Hippocrates, St. Francis, and Osler.

Yet their names will never be known to legend and history or perhaps even to science.

The last to covet fame, in fact often the first deliberately to avoid it, these men and women, your immediate predecessors, stuck to their faith in the cause of public health despite handicaps and hardships which you may never have to experience. They rarely had security in tenure of office, but were subject to removal with each political upheaval. They were woefully underpaid and cruelly overworked. They had neither funds nor time nor perhaps ability to seek the rewards of scientific research. They had so little to offer personnel in the way of salaries or security that they had often to be satisfied with men poorly equipped and usually had to do their own training. They were in constant political danger and often in physical danger which destroyed their health and sometimes claimed their lives.

But they never doubted that the game was worth the candle; they hung on because the cause for which they labored was a great cause and thereby they themselves became great, if unsung. Their reward was the abiding satisfaction of lowered death rates, of less illness, of increased life spans, and of greater health and happiness for their people. Are these rewards enough for us?

The urgent work of national defense will rest heavily on your younger and stronger shoulders. Your ability to preserve and protect the health of the civilian population may well be the deciding factor in this world struggle to preserve the freedom of mankind. You are better trained, better understood, better supported, and better led than your predecessors. With firm faith in the cause, you will bring us closer to the day when freedom of mankind also means freedom from preventable illness and premature death.

CONCLUSION

I have pointed out that we are in the throes of the greatest defense effort in terms of time, men, and money, that this Nation has ever put forth. Inherent in this effort is the fact that the military establishment of the Nation must have first claim to the Nation's resources, but a close second in immediate as well as in long-time importance is civilian health preservation. This is squarely our responsibility since we who are trained in the medical and public health professions have the knowledge and skill which qualify us to guide the health destinies of the Nation. We must be prepared to expect certain handicaps and difficulties none of which are new or insurmountable. I have presented briefly some of the new tasks already discernible in the national defense program which we may be expected to assume. Finally, we have reviewed some of the special advantages enjoyed by the present generation of public health workers which were unknown to their predecessors. The health of the Nation assumes greatly

increased importance in times of war and preparation for war. The public health profession will not be found wanting in ability to deal with the urgent and serious tasks of national defense before us if we continue to pursue our work with conviction, faith, devotion, and courage.

LEAD AND ARSENIC INGESTION AND EXCRETION IN MAN

By STEWART H. WEBSTER, *Biochemist, United States Public Health Service*

INTRODUCTION

The determination of the lead and arsenic content of biological specimens from a large number of individuals comprised a part of the chemical investigation of the lead arsenate spray residue study (*1*). Blood and urine samples were ordinarily secured at the time of the regular physical examinations and the analyses of these single specimens, therefore, represented only instantaneous pictures of concentration levels. Single fecal samples were secured from a group of about 48 persons at two different times of the year but the analytical values gave only qualitative comparisons of excreted lead and arsenic.

Since the investigation of Fairhall and Neal (*2*) on the absorption and excretion of lead arsenate in two individuals, it appeared desirable to extend this work to other persons having histories of extended exposure to lead arsenate and with potentially higher levels of intake of lead and arsenic during this time.

The purpose of the following investigation was to determine the maximal quantities of lead and arsenic excreted daily by orchardists consuming apples which had been sprayed with lead arsenate and to obtain an estimate of the quantities of these elements ingested with the fruit.

EXPERIMENTAL PROCEDURE

Nine healthy adult male orchardists who lived in the vicinity of Wenatchee, Washington, and all but one of whom had three routine physical examinations were selected as subjects for this experiment because of their typical exposure and customary habit of eating unwashed apples.[2] Four of the subjects received their examination 1 or 2 days before starting the experiment; for the other 5, the previous examination was made 3 to 5 months earlier. In 3 cases the final routine examination was made after the conclusion of the experiment, the time ranging from 1 day to nearly 3 months. None of these physical examinations revealed a combination of signs and symptoms indicative of lead arsenate intoxication. These men were

---

[1] From the Division of Industrial Hygiene, National Institute of Health.

[2] As used in this study, the term "washing" refers solely to the commercial washing treatment for apples and pears.

asked to eat as many average-sized unwashed lead arsenate sprayed apples during the 10–12-day experimental period as they ordinarily would eat during the peak apple consumption period, and to keep a record of the number eaten each day. Before starting the experiment each man reserved a separate lot of apples and confined his apple eating during the experimental period to his particular lot of fruit.

The total urinary and fecal output of each of the 9 orchardists during each 24-hour interval for the entire period was collected in lead- and arsenic-free containers in the manner previously described (*1*, *3*). A portion of each day's urine, a record of total daily volume, and the daily fecal output were sent to the National Institute of Health for analysis, together with a sample of the apples eaten by each individual during the test period. Information was secured in most cases regarding the condition of the apples, whether wiped or unwiped, before being consumed.

This experiment differed somewhat from the study undertaken earlier by Fairhall and Neal. In the former investigation 2 individuals having no appreciable lead or arsenic exposure previous to the experiment ingested 10 mg. of lead arsenate daily for 10 days; a fairly strict diet was provided, and a fore and after period observed, with a 4-day period of medication during the 13-day after period. In the present work 9 individuals who were orchardists and who therefore had had considerable previous exposure[3] to lead arsenate regulated the quantity of this substance ingested by the number of apples per day. Otherwise these men followed their usual work and continued on their customary diet; no fore or after period was observed, and no medication was administered at any time.

This study was not a balance experiment, in the usual sense of the term, since the intake could not be accurately controlled and volunteer subjects were not available for the extended time required for the usual fore, after, and experimental periods. From analyses of representative samples of the fruit eaten by each man it was hoped to estimate the quantities of lead and arsenic actually eaten. In any case such analyses would represent potential if not actual quantities consumed.

Each lot of fruit was treated in the following manner: Every apple was weighed and the average diameter was measured with a vernier caliper. After cutting out and throwing away that part of the skin adjacent to the stem and calyx which is not ordinarily eaten, the rest of the peeling and fruit were weighed separately. The peelings from a given lot of apples were combined and ashing was carried out in the customary way. No further use was made of the fruit portions of the apples. By ashing the edible peelings rather than the whole edible

[3] The length of time in orchard work ranged from 9 to 29 years and averaged 19 years, ages of subjects ranged from 34 to 53 and averaged 43 years.

portion[4] the amount of lead and arsenic commonly ingested was secured and the troublesome ashing of bulky apple residues was avoided.

Analyses were made for lead and arsenic on each lot of apples and on a sample of each day's urine and fecal specimen for each man as described elsewhere.[5] The weights of the daily individual output of feces (calculated on the dry basis) varied considerably and ranged from 6.1 to 63.6 gm., with an average of 35.3 gm. for 96 specimens. This is within the average range of 20 to 40 gm. per day given by Taylor (*4*).

EXPERIMENTAL RESULTS

The analytical findings are summarized in the following tables. Table 1 indicates the lead and arsenic content of representative samples of apples eaten by the 9 experimental subjects. In column 3 headed "condition" is recorded the treatment of the apples before being sent to the laboratory for analysis. No washed apples were eaten by any of the men. However, it was customary to wipe the fruit before eating it. It was found that, depending upon the thoroughness with which this was done, more or less lead and arsenic was removed in the process. Analyses of apples which were unwashed but which had been carefully wiped with cloths showed an average lead load, for the edible portion, of 4 mg. per apple. Likewise, analyses showed that the wiping of the apples removed only a part of the original arsenic. These experiments indicated that about a third of the residue was removed by the wiping process.

TABLE 1.—*Lead and arsenic content of samples of apples eaten by experimental subjects*

Experiment No.	Number of apples analyzed	Condition	Average weight, gm.	Average diameter, cm.	Total mg. of lead	Mg. of lead per apple	Total mg. of arsenic	Mg. of arsenic per apple	Consumption		Number of lead arsenate sprays
									Daily[1]	Annual	
1	14	W[2]	188.7	7.6	135.3	9.66	8.1	0.58	1.8 W	400B[4]	8
2	11	W	208.6	7.8	41.1	3.74	12.7	1 15	1.8 W	1,000 NW[5]	7
3	12	W.	153.9	7.1	42.1	3.51	6.7	.56	1.9 W	50 B.	6
4	12	UnW[3]	154.4	7.2	75.2	6.27	13 4	1.12	1.7 W	700 NW	7
5	10	W	155.5	7.2	34.3	3.43	9.0	.90	2 3 W	600 B	8
6	17	UnW	121.0	6.6	8.3	.49	15.9	.94	2 1 UnW	800 B	4
7	9	W	151.9	7.1	51.0	5.67	13.2	1.47	4.7 W	1,000 P[6]	8
8	15	(?)	153.7	7.1	35.1	2.34	8.0	.53	3.0 ?	1,000 B	6
9	10	(?)	135.2	6.7	12.8	1.28	8.3	.83	7.4 ?	800 NW	4
Total	110		Aver. 157.1	Aver. 7.1		Aver. 4.0		Aver. 0.89			

[1] Average during test period.
[2] W=wiped.
[3] UnW=unwiped.
[4] B=both washed and unwashed.
[5] NW=not washed.
[6] P=pared.

[4] By edible portion is meant the whole apple except the stem, portions around stem and calyx ends, and the core. This represents that part of the unpared apple which is ordinarily eaten.

[5] Lead in apple and fecal samples was determined by the chromate method (*1*), and in urine by a photometric dithizone method (*1, 3*). All arsenic analyses were made using the Gutzeit method (*1*).

One of the subjects, No. 6, claimed to have eaten unwiped apples during the experiment, one (No. 4) wiped the fruit before eating it but sent in unwiped apples, and for 2 (Nos. 8 and 9) the condition of the apples was not known so they were assumed to be unwiped as received.

Table 1 also shows that the lead and arsenic loads varied widely, ranging from about 0.5 to nearly 10 mg. of lead per apple, the average being nearly 4.0 mg. This is equivalent to 6.76 mg. of lead arsenate. The unpared apples varied in weight from 83.5 to 166.3 gm. and ranged in diameter from 5.7 to 8.7 cm., the corresponding averages being 157.1 gm. and 7.1 cm., respectively. The lead load on the ingested portion averaged 25.5 mg. per kg., which is equivalent to very nearly 10 times the tolerance of 0.018 grains of lead per pound (0.018 grains per lb. equals 2.57 mg. per kg.). If the lead present in the stem and calyx portions were added to the lead load as determined above, the values would be still higher.

In the columns headed "consumption" two figures are given for each individual; the first is the average daily consumption of apples during the test period, and the second, the annual consumption based upon the estimate of the subjects concerned. It will be noted that the condition of the fruit as well as the quantity consumed by these men varied considerably. The last column gives the number of lead arsenate sprays applied to the various lots of apples selected for this experiment.

TABLE 2.—*Estimated quantities of lead and arsenic on samples of apples consumed by experimental subjects*

Experiment No.	Total number of apples eaten in 10-12 days	Period of experimental apple consumption in days	Estimated total quantity on apples eaten by subjects: Mg. Pb	Estimated total quantity on apples eaten by subjects: Mg. As
1	17.5	10	169 1	10.2
2	18	10	67.3	20 7
3	19	10	66.7	10.6
4	17	10	71.0	12.7
5	27	12	92.6	21.3
6	21	10	10.3	19.7
7	47	10	266.5	69.1
8	30	10	46.8	10.6
9	74	10	63.1	40.9
Total	270 5	92	853.4	218.8
Average per person for experimental period	30.1	10.2	94 8	21.3
Average per person per day	3.0		9.3	2.4

Table 2 shows the estimated intake of lead and arsenic for each person for the 10–12-day test period together with average values for the total time and also per day. The total quantity of lead ingested by each person was found by multiplying the average lead load per apple for his particular lot of fruit (see table 1) by the number of

apples eaten during the experimental period. The corresponding quantity of arsenic was calculated similarly. In 3 cases the lead and arsenic loads of the wiped fruit were calculated as two-thirds that of the unwiped fruit analyzed.

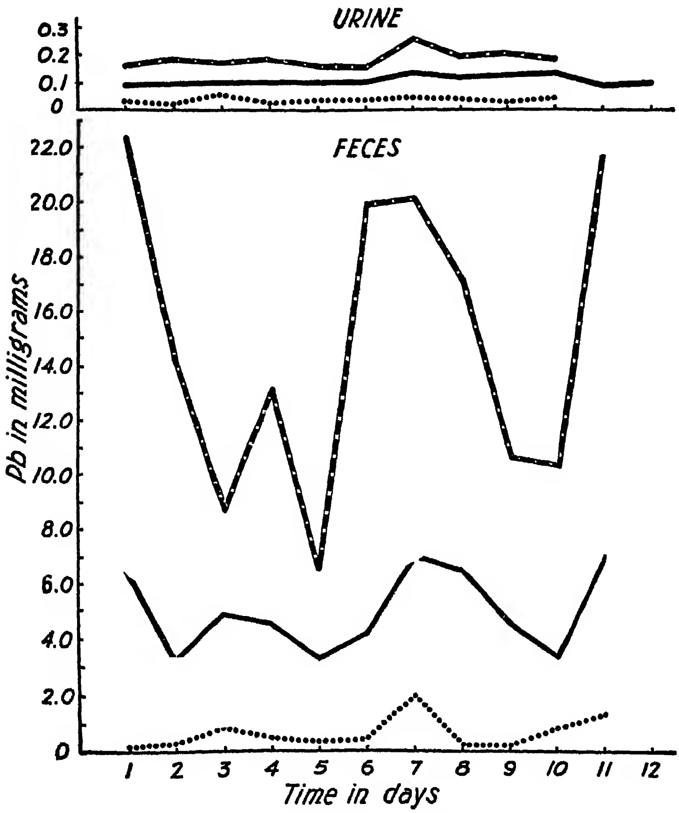


FIGURE 1.—Urinary and fecal lead outputs for a group of 9 experimental subjects. Daily maximum (- - - -), average (——), and minimum (. . . .).

Three hundred and seventy-six measurements were made in determining the individual daily outputs of urinary and fecal lead and arsenic. Figures 1 and 2 present in graphic form the minimum, maximum, and average values for *each* day, while the highest and lowest values for lead and arsenic excreted during any day of the experimental period are as follows:

	Output, mg. per day	
	Minimum	Maximum
Urinary lead	0.023	0.260
Fecal lead	.22	22.25
Urinary arsenic	.035	.637
Fecal arsenic	.008	2.04

The graphs show the wide range in daily variation as well as the relative magnitudes of the various measurements. The low and high values shown do not necessarily correspond to identical individuals from day to day. Especially noteworthy is the marked difference between fecal and urinary lead outputs.[6] To a lesser degree this difference is exhibited for arsenic also.

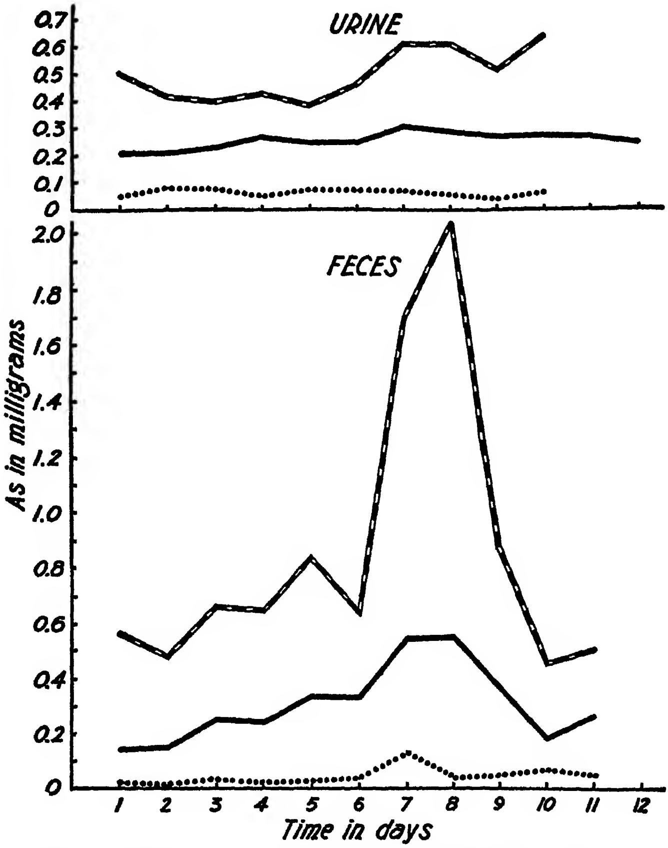


FIGURE 2.—Urinary and fecal arsenic outputs for a group of 9 experimental subjects. Daily maximum (- - - -), average (———), and minimum (. . . . .).

The small variation in the total daily urinary lead output for several of the individuals studied is rather remarkable. In fact, for any person, the urinary lead output varied much less from day to day than any of the other measurements. This is shown in table 3, giving the average daily deviation from the mean values for the 10–12-day period for the four types of determinations. Since the number of apples eaten by the subjects from day to day varied and therefore the amounts of lead and arsenic ingested were not constant, the great

[6] Fecal lead values have been plotted with a different scale for convenience in presenting the data.

TABLE 3.—*Variation in 24-hour lead and arsenic outputs in experimental subjects*

Experiment No.	Average deviation of daily output from the mean value for the 10–12-day period (all values in mg.)			
	Urinary Pb	Fecal Pb	Urinary As	Fecal As
1	0.009	4.16	0.046	0.181
2	.012	1.11	.033	.033
3	.042	2 95	.150	.134
4	.015	4.46	.066	.099
5	.041	6.12	.082	.477
6	.008	1.99	.012	.046
7	.020	2.23	.049	.234
8	.008	1.61	.013	.029
9	.027	.75	.068	.153
Average for all 9 persons	.019	2.86	.055	.154

uniformity of the urinary lead output for any one subject from day to day was all the more notable.

Table 4 gives the total quantities of the two constituents excreted by each person during the experimental period. The high average value of more than 5 mg. for the daily lead output is of considerable interest since the exposure of these experimental subjects is typical of a large group of orchardists. The average value of about 0.6 mg. of arsenic per day is low in comparison with the quantities of lead found and is difficult to explain.

TABLE 4.—*Lead and arsenic excreted in urine and feces of 9 subjects during the experimental period*

Experiment No.	Total urinary lead (mg.)	Total fecal lead (mg.)	Total urinary and fecal lead (mg.)	Total urinary arsenic (mg.)	Total fecal arsenic (mg.)	Total urinary and fecal arsenic (mg.)	Number of daily specimens	
							Urine	Feces
1	1.50	93.90	95.4	4.87	3.62	8.49	10	11
2	.871	20.50	21.37	.949	.686	1.64	10	11
3	1.550	59.45	61.00	3.74	3.00	6.74	10	11
4	.898	73.00	73.50	1.86	2.00	3.86	10	11
5	1.400	102 7	104.2	4.01	7.75	11.76	12	11
6	.416	31.25	31.67	.680	.878	1.56	10	11
7	1.733	52.37	54.10	4.03	4.03	8.06	10	10
8	.928	13.91	14.84	.857	.636	1.49	10	10
9	1.171	37.09	38.26	4.41	6.55	10.96	10	10
Total	10.53	483.8	494.3	25.41	29.15	54.56	92	96
Average per person for 10–12 days	1.17	53.8	54.9	2.82	3.24	6.09	10.2	10.6
Average per person per day	.11	5.04	5.15	.28	.30	.58		

From the values given in this table it was found that the ratio of urinary to fecal lead averaged 2 percent with extremes of 1 to 7 percent. Also, the total fecal arsenic was about 15 percent greater than the total urinary arsenic. This was an unexpected result since, in the experiment of Fairhall and Neal, fecal arsenic amounted to mere traces in most samples and the total fecal arsenic was less than one-half percent of the quantity of urinary arsenic recovered.

It is probable that a considerable portion of the lead arsenate on the apple passed through the gastro-intestinal tract essentially unchanged. Analyses of fecal specimens from nearly 50 men examined at two periods of the year confirmed this view since 91 percent of the specimens showed fecal arsenic (*1*).

It is of interest to mention the recent work of St. John, McCulloch, Sotola, and Todhunter (*5*) who concluded that lead arsenate administered by capsules to sheep is more toxic than the same amount sprayed on vegetation and subsequently eaten by the sheep.

It is possible, therefore, that the pure lead arsenate and the weathered spray residue material may differ in both physical and chemical properties. Whether the observed difference in behavior of the arsenic portion of the molecule as studied in humans is due to the effect of chronic ingestion of lead and arsenic compounds or is due to differences in the properties of the ingested substances is not known.

In a number of cases high initial excretory values for the first day of the experiment were found but no regular correspondence between lead and arsenic measurements was observed. Whether these high initial values were due to previous exposure or resulted from the subjects eating large quantities of apples immediately before undertaking the experiment could not be ascertained. Two pertinent facts are known, however. First, this experiment was conducted during a time of year in which orchard activities involving high exposure to lead arsenate were at a minimum. Second, the normal apple consumption during this time of year was certainly below the average for the whole year.

Due to the experimental limitations already mentioned no balance could be accurately determined. In about half of the subjects there was fair agreement between the estimated intake and the measured output of lead and arsenic. It is evident, however, that in the remaining individuals the lead and arsenic were incompletely recovered although the exact differences could not be ascertained.

In the experiment of Fairhall and Neal a considerable fraction of these elements was not eliminated from the body during the 10-day period of ingestion, since lead and arsenic were still being excreted 13 days after the ingestion of lead arsenate had been stopped. The 2 subjects each ate an equivalent of 59.7 mg. of lead and 21.6 mg. of arsenic during the 10 days and the recoveries of these elements during that same time averaged 67 and 61 percent, respectively.

In the present study, the 9 subjects showed average recoveries for 10-day periods of 53 and 25 percent for lead and arsenic, respectively, based upon an estimated intake somewhat higher than in the former work.

The incomplete recovery of the lead and arsenic in the present

had not taken place, so that these elements were being stored, or that they were being eliminated through other channels. The presence of lead in the saliva and perspiration and the presence of arsenic in the hair (*6*) and nails and possibly in the perspiration has suggested other avenues of immobilization and excretion.

The systemic effects of this ingested spray residue material were not specifically investigated, since this question was considered in the lead arsenate spray residue study (*1*). Furthermore, it was not possible in this work to study a number of important problems related to this investigation, such as relative toxicities of pure lead arsenate and lead arsenate spray residue, relative rates of elimination of lead and arsenic, and relation of diet to the toxicity of lead arsenate. These problems are fundamental for an understanding of the toxicology of lead and arsenic and can be solved only by continued and intensive research.

SUMMARY AND CONCLUSIONS

Experiments were made with 9 healthy adult orchardists who ate lead arsenate sprayed apples during a period of 10 to 12 days. The daily consumption ranged from 0 to 10 and averaged 3.0 apples per person. Analyses of samples of the fruit eaten by the men showed a potential intake of from 1 to 26 mg. of lead and 0.34 to 6.8 mg. of arsenic per person per day.

Analyses of daily urine and fecal specimens from these subjects during the experimental period were made to measure the excretion of lead and arsenic during this time. The total 24-hour output of lead and arsenic per man amounted to as much as 22.3 mg. and 2.43 mg., respectively.

Wide variability in the quantities of urinary and fecal lead and arsenic excreted daily by different individuals was shown to be the rule. The 24-hour urinary lead output for a given individual was usually found to vary less from day to day than the other daily outputs (urinary arsenic and fecal lead and arsenic).

Comparison of the results of this investigation with those obtained earlier by Fairhall and Neal showed that in both experiments by far the largest part of the lead was eliminated in the feces. However, in the present study the fecal arsenic equalled or exceeded the urinary arsenic output in the majority of persons studied, while in the earlier experiment only traces of fecal arsenic were regularly found. Two explanations were offered for this difference. One suggested that the weathered spray residue may differ from pure lead arsenate in physical and chemical properties. The second postulated that individuals having chronic exposure to lead and arsenic compounds may differ from persons with only acute exposure in their utilization and ex-

cretion of arsenic. The experimental data were insufficient to decide this question.

The quantities of lead and arsenic excreted in the 10- to 12-day period generally were less than the amounts estimated to be ingested during that same time. Conditions did not permit the determination of the balance between intake and output. Several possible explanations for the apparent retention of these elements were suggested.

There has been indicated the need for further research on some of the unsolved fundamental problems relating to the toxicology of lead and arsenic.

ACKNOWLEDGMENTS

It is a pleasure to record the author's indebtedness to Principal Industrial Toxicologist Lawrence T. Fairhall and Passed Assistant Surgeon Waldemar C. Dreessen for consultation and advice and to the following persons: Passed Assistant Surgeon Harold T. Castberg for securing and shipping the specimens and for preparing the graphs, Associate Biochemist Harry D. Baernstein, Junior Chemist Joseph A. Grand, and Assistant Scientific Aide Stuart W. Jones for assistance with the arsenic analyses, Assistant Chemist William F. Knop, Junior Chemist Peter J. Valaer, Under Laboratory Helper Walter W. Fowkes, and Assistant Scientific Aide Norman E. Sharpless for aid with the arsenic and lead analyses, Junior Chemist Frances L. Hyslop for assistance with the lead, arsenic, and other determinations and for help in preparing the manuscript, and finally the 9 persons whose cooperation made this study possible

REFERENCES

(*1*) Neal, P. A., Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Webster, S. H., Castberg, H. T., and Fairhall, L. T.: A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bulletin No. 267. U. S. Government Printing Office, 1941.

(*2*) Fairhall, L. T., and Neal, P. A.: The absorption and excretion of lead arsenate in man. Pub. Health Rep., **53**: 1231–1245 (1938). Reprint 1960.

(*3*) Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Page, R. T., Webster, S. H., Armstrong, D. W., and Sayers, R. R.: The control of the lead hazard in the storage battery industry. Public Health Bulletin No. 262. U. S. Government Printing Office, 1941.

(*4*) Taylor, A. E.: Digestion and metabolism. Lea and Febiger, 1912. Page 209.

(*5*) St. John, J. L., McCulloch, E. C., Sotola, J., and Todhunter, E. N.: Toxicity to sheep of lead arsenate and lead arsenate spray residues. J. Agri. Research, **60**: 317–329 (1940).

(*6*) Blumenfeldt, S.: Die Verteilung des Arsens im Körper unter besonderer Berücksichtigung mehrfacher Giftdosen. Deut. Z. ges. gericht. Med., **15**: 501–521 (1930).

THE DENTAL STATUS AND DENTAL NEEDS OF YOUNG ADULT MALES, REJECTABLE, OR ACCEPTABLE FOR MILITARY SERVICE, ACCORDING TO SELECTIVE SERVICE DENTAL REQUIREMENTS [1 2]

By HENRY KLEIN, *Dental Officer, United States Public Health Service*

INTRODUCTION

During the winter and spring of 1940–41 dental examinations were made of 947 young men enrolled in National Youth Administration projects located in Maryland and West Virginia, and of 451 men attending the National Defense Training School of Hagerstown, Md. Among approximately 1,400 individuals there were 642 within the age range 21 through 35 years. The dental examination record of each of these 642 men was reviewed with the purpose of finding those who would and those who would not meet the dental requirements set down by Selective Service for admittance to military duty. These requirements are given in the United States War Department Mobilization Regulations MR1–9, issued August 31, 1940, as follows:

Paragraph 31. Classes 1–A and 1–B.

a. *Class 1–A.*

(1) Normal teeth and gums.

(2) A minimum of three serviceable natural masticating teeth above and 3 below opposing and three serviceable natural incisors above and three below opposing. (Therefore, the minimum requirements consist of a total of 6 masticating teeth and of six incisor teeth.) All of these teeth must be so opposed as to serve the purpose of incision and mastication.

(3) *Definitions.*

(*a*) The term "masticating teeth" includes molar and bicuspid teeth, and the term "incisors" includes incisor and cuspid teeth.

(*b*) A natural tooth which is carious (one with a cavity), which can be restored by filling, is to be considered as a serviceable natural tooth.

(*c*) Teeth which have been restored by crowns or dummies attached to bridgework, if well placed, will be considered as serviceable natural teeth when the history and the appearance of these teeth are such as clearly to warrant such assumption.

(*d*) A tooth is not to be considered a serviceable natural tooth when it is involved with excessively deep pyorrhea pockets, or when its root end is involved with a known infection that has or has not an evacuating sinus discharging through the mucous membrane or skin.

b. *Class 1–B.*

Insufficient teeth to qualify for class 1–A, if corrected by suitable dentures.

Paragraph 32. Class 4.

a. Irremediable disease of the gums of such severity as to interfere seriously with useful vocation in civil life.

---

[1] From the Division of Public Health Methods, National Institute of Health.

[2] Presented before the annual meeting (April 29, 1941) of the Milbank Memorial Fund, New York City, N. Y.

b. Serious disease of the jaw which is not easily remediable and which is likely to incapacitate the registrant for satisfactory performance of general or limited military service.

c. Extensive focal infection with multiple periapical abscess, the correction of which would require protracted hospitalization and incapacity.

d. Extensive irremediable caries.

For the purpose of the present report, the men who would meet the requirements for class 1–A are designated "acceptables" and those who would not meet class 1–A requirements are designated "rejectables." The age distributions of the two groups of men are given in table 1. A total of 545 men showed a dental status which would justify their being designated acceptable (dentally) for full military duty (class 1–A). The other 97 men, approximately 15 percent, fell into the rejectable group.[3] [4]

TABLE 1.—*Number of men examined and number found rejectable or acceptable and percentage found rejectable. Data arranged by single chronological ages and derived from examination of 642 men of West Virginia and Maryland*

Group examined	Chronological age (last birthday) in years															
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	All ages
	Number examined															
Both	145	121	107	75	31	21	28	10	29	13	11	18	13	10	10	642
Rejectables	10	12	14	6	5	3	4	3	10	4	5	8	4	4	5	97
Acceptables	135	109	93	69	26	18	24	7	19	9	6	10	9	6	5	545
	Percentage rejectable															
	6.9	9.9	13.1	8.0	16.1	14.3	14.3	30.0	34.5	30.8	45.5	44.4	30.8	40.0	50.0	15.1

METHOD

The method used in the present analysis for describing dental status and dental needs is based upon considerations described fully in previous communications (*1, 2, 3, 4, 5*). This method has been adopted in part, or completely, by several investigators (*6, 7, 8, 9*). Description of dental status is accomplished through measurement of (*a*) the tendency to be attacked by caries (the amount of caries experienced), (*b*) the volume of dental service received (the filled caries experience), and (*c*) the residuum of experience with caries which has not received

[3] The percentage of rejections obtained here is somewhat higher than that observed from actual Selective Service findings. The higher percentage found in the West Virginia and Maryland men is probably, in part, a resultant of a difference in age distribution. The actual selectees are probably somewhat younger than the men examined for the present study. Other factors probably also contribute to the high percentage of rejectables for dental conditions. Among these may be mentioned the socioeconomic status of the men examined and the possibility that some of them might be counted by Selective Service as rejectable for other than dental defects.

[4] The rejectables include some men who have insufficient teeth to qualify for class 1–A and who do not have their insufficient teeth "corrected by suitable dentures" (thus they do not qualify for class 1–B) and who obviously do not have enough irremediable dental disease to qualify them for class 4.

treatment by fillings (the unfilled caries experience). Dental needs (due to caries) are measured in terms of the three ingredients of the unfilled residuum of caries experience, namely, (*a*) the tooth surfaces carious and requiring fillings, (*b*) the teeth carious and indicated for extraction, and (*c*) the teeth already extracted presumably because of caries involvement. These two latter ingredients (*b* and *c*) together represent the need for prosthetic replacements.

Measurement of the tendency to experience caries is based on the fact that the stigmata of caries attack are essentially nonerasable. For example, a permanent tooth attacked by caries in a person 7 years of age will appear at a later chronological age as a carious tooth which should be filled, as a tooth which has been filled, as a tooth so extensively carious as to require extraction, or as a tooth already extracted. Teeth which fall into any of these four categories of caries experience are designated "DMF teeth" (decayed, missing, and filled)[5] (*1*). The summation of the numbers of permanent teeth representing these categories of caries experience, expressed on a per man basis, provides a broad measure of the tendency of a group to experience caries attack. A more detailed description of caries tendency is obtained by summation of the number of permanent tooth surfaces which fall into the several categories of caries experience. Such surfaces are termed "DMF surfaces"[6] (*1*).

In the present analysis, the tendency to experience caries is described in these terms for the rejectables and for the acceptables. The variation among the men of each group with respect to this tendency is described in terms of the number and percentage of men having particular numbers of DMF teeth and as the number and percentage of men having particular numbers of DMF surfaces.

A second component of dental status, that is, the filled caries experience, is measured broadly as the number of filled teeth per man, and the variation of this component is expressed as the number and percentage of men having particular numbers of filled permanent teeth. A more detailed insight into the volume of fillings received is obtained by determining the number of filled permanent tooth surfaces per man. The variation among the men with respect to this factor is expressed as the number and percentage of men showing particular numbers of filled surfaces.

The third component of dental status, the unfilled caries experience, is measured by adding together the teeth carious and in such condition as to warrant and require treatment by fillings, the teeth so extensively carious as to require extraction, and the teeth already extracted from

[5] The summation of these several categories has been designated by various symbols. The term "ex-teeth" is used by Salzmann (*10*) and the symbol "ABC teeth" by Sloman and Sharp (*11*). In the summations used in the present paper a tooth both carious and filled is counted as 1 DMF tooth

[6] In this summation a surface both carious and filled is counted as 1 DMF surface An extracted tooth is arbitrarily counted as 5 DMF surfaces

the mouth presumably because of extensive damage by caries. A detailed quantification of unfilled caries experience is then obtained by totaling the number of tooth surfaces which are carious in teeth requiring fillings and in teeth requiring extraction, plus the surfaces which may be presumed to have been carious in teeth already extracted. Information on the three major components of dental status as observed in the rejectables and acceptables is given in tables 2 and 3.

TABLE 2.—*Status of permanent teeth of rejectables (R) and acceptables (A). Rates for specified components of dental status are expressed per man of specified chronological age group. Data derived from examination of 642 men of West Virginia and Maryland*

Components of dental status (teeth)	Group	Chronological age in years (last birthday)															
		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	All ages
Carious, requiring fillings	R	4.9	5.4	6.9	7.0	5.2	4.0	5.3	4.7	5.3	5.3	5.2	7.9	3.0	3.5	2.4	5.4
	A	5.5	5.3	5.6	5.5	5.4	6.6	6.0	4.6	5.6	5.6	3.8	5.8	7.0	3.2	7.2	5.5
Extracted	R	10.1	9.4	10.6	11.3	14.0	10.0	11.5	12.7	14.2	15.3	22.8	11.4	14.5	20.3	20.8	13.0
	A	2.1	1.9	2.6	2.0	3.8	3.9	3.1	3.9	4.0	5.7	4.5	5.4	3.2	2.7	6.6	2.6
Carious, indicated for extraction	R	3.4	3.9	2.6	3.0	1.0	6.3	1.8	3.0	1.2	4.8	0	1.6	.5	1.5	.6	2.4
	A	.7	.5	.6	.3	.8	1.3	1.5	.7	1.5	.8	.7	1.4	1.6	.8	1.0	.7
Filled	R	1.0	2.2	2.6	3.5	1.0	0	1.8	2.7	3.0	1.5	1.8	2.6	2.0	1.0	2.0	2.1
	A	1.8	1.9	2.3	3.3	8.0	2.3	2.8	2.4	3.5	5.2	5.5	2.8	1.2	4.5	2.6	2.4
DMF	R	19.2	20.7	22.0	24.5	21.2	20.3	19.8	22.0	23.2	26.5	29.4	22.8	19.3	25.5	25.6	22.5
	A	9.8	9.4	10.9	10.8	12.8	13.7	13.4	11.0	14.3	16.4	13.8	15.3	12.9	10.8	17.2	11.0

TABLE 3.—*Status of permanent tooth surfaces of rejectables (R) and acceptables (A). Rates for specified components of dental status are expressed per man of specified chronological age group. Data derived from examination of 642 men of West Virginia and Maryland*

Components of dental status (surfaces)	Group	Chronological age in years (last birthday)															
		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	All ages
Carious, requiring fillings	R	6.6	7.7	9.7	10.2	5.8	5.0	8.0	5.0	7.7	7.8	9.4	11.3	4.3	3.5	3.6	7.6
	A	7.2	6.7	7.1	7.1	7.0	8.1	7.4	6.3	6.7	7.0	4.2	8.4	8.9	4.2	8.8	7.1
Extracted	R	50.5	47.1	52.9	56.7	70.0	50.0	57.5	63.3	71.0	76.8	114.0	56.9	72.5	101.3	104.0	65.2
	A	10.3	9.4	13.1	10.1	18.8	19.4	15.4	19.3	20.0	28.3	22.5	27.0	16.1	13.3	33.0	13.1
Carious, indicated for extraction	R	14.6	15.8	11.9	13.0	4.4	31.7	8.8	10.0	4.5	17.3	0	5.8	1.8	4.8	2.4	9.9
	A	2.9	2.4	2.7	1.3	3.2	4.6	6.0	3.1	6.3	2.9	2.2	5.8	7.1	3.3	5.0	3.0
Filled	R	1.5	2.6	3.0	6.3	1.6	0	4.5	3.3	5.0	2.5	2.4	4.5	3.0	2.3	2.2	3.1
	A	2.9	2.8	3.5	5.8	4.9	3.4	4.9	3.3	6.1	10.2	8.8	5.0	1.8	9.3	3.8	4.0
DMF	R	73.2	73.0	77.4	86.2	81.8	86.7	78.8	80.7	88.0	103.8	125.8	78.1	80.8	111.5	112.0	85.7
	A	23.2	21.2	26.3	24.1	33.9	35.3	33.6	31.6	39.0	48.1	37.3	46.2	33.7	30.0	50.6	27.0

CARIES EXPERIENCE

At 21 years of age the rejectables have accumulated more than 19 DMF permanent teeth and more than 73 DMF surfaces per man.

ency. This is shown by the finding (tables 2 and 3) that they have accumulated up to 21 years of age less than 10 DMF teeth and fewer than 24 DMF surfaces per man. With advancing chronological age, teeth (and tooth surfaces) not previously attacked develop caries experience. This occurs in both groups, as shown in tables 2 and 3 and figure 1. For the entire age range, 21–35 years, the rejectables

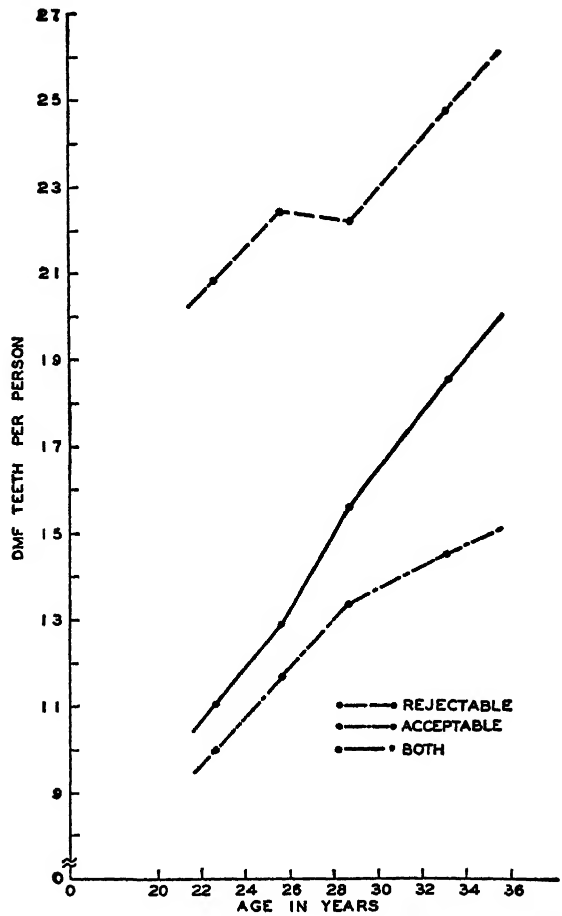


FIGURE 1.—Chronological age and the number of DMF teeth per person The plotted points represent averages for the age groups 21–23, 24–26, 27–29, and 30–35 years

show close to 23 DMF teeth and more than 85 DMF surfaces per man, while the acceptables show only approximately 11 DMF teeth and 27 DMF surfaces.

Further insight into the differences between the two groups in their respective tendencies to experience caries may be obtained through study of the number and percentage of men having particular numbers of DMF teeth. Table 4 gives such information. Close to

3 percent of the acceptables are free of DMF teeth while none of the rejectables have fewer than 7 DMF teeth. At the other end of the range, no acceptable has more than 28 DMF teeth, while more than 16 percent of the rejectables have 28 or more. Where half the rejectables (53.6 percent) have 22 or more DMF teeth, less than 5 percent (4.4 percent) of the acceptables have this many. Furthermore, where 100 percent of the rejectables have 7 or more DMF teeth, less than 75 percent (74.7) of the acceptables have this number.

TABLE 4.—*Number and accumulated percentage of men having specified numbers of DMF teeth and DMF surfaces. Data arranged by acceptable and rejectable groups for the chronological ages 21–35 years, inclusive, and derived from examinations of 642 men of West Virginia and Maryland*

Number of DMF teeth	Acceptables		Rejectables		Number of DMF surfaces	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage		Number	Accumulated percentage	Number	Accumulated percentage
32			6	6.2	160			6	6.2
31			1	7.2	139–135			1	7.2
30			5	12.4	134–130			2	9.3
29			1	13.4	129–125			1	10.3
28	1	0.2	3	16.5	124–120			3	13.4
27	2	.6	6	22.7	119–115			3	16.5
26	3	1.1	7	29.9	114–110			1	17.5
25	4	1.8	7	37.1	109–105			3	20.6
24	3	2.4	3	40.2	104–100			4	24.7
23	6	3.5	5	45.4	99–95			6	30.9
22	5	4.4	8	53.6	94–90			7	38.1
21	9	6.1	8	61.9	89–85			3	41.2
20	16	9.0	11	73.2	84–80			7	48.5
19	16	11.9	3	76.3	79–75	1	0.2	8	56.7
18	19	15.4	10	86.6	74–70	8	1.7	10	67.0
17	21	19.2	5	91.8	69–65	6	2.8	14	81.4
16	28	24.4	2	93.8	64–60	14	5.3	6	87.6
15	25	29.0	1	94.8	59–55	22	9.4	2	89.7
14	32	34.8	1	95.9	54–50	19	12.8	4	93.8
13	29	40.2	1	96.9	49–45	24	17.2	3	96.9
12	25	44.8	0	96.9	44–40	37	24.0	2	99.0
11	32	50.6	2	99.0	39–35	39	31.2	0	99.0
10	33	56.7	0	99.0	34–30	51	40.6	0	99.0
9	37	63.5	0	99.0	29–25	54	50.5	0	99.0
8	32	69.4	0	99.0	24–20	55	60.6	0	99.0
7	29	74.7	1	100.0	19–15	55	70.6	*1	100.0
6	35	81.1			14–10	61	81.8		
5	20	84.8			9–5	48	90.6		
4	17	87.9			4–1	36	97.2		
3	21	91.7			0	15	100.0		
2	15	94.5							
1	15	97.2							
0	15	100.0							
All	545		97		All	545		97	

* 1 rejectable had 19 DMF surfaces.

Similar differences between the rejectables and acceptables appear when the number and percentage of men having particular numbers of DMF surfaces are studied. Thus, as shown by the data given in table 4, no rejectable has fewer than 19 DMF surfaces while 200 acceptables, or close to 37 percent, have fewer than 19 DMF surfaces, and 2.8 percent of the acceptables are free of such surfaces. On the other hand, 55 of the rejectables, or more than 56 percent, show 75

These findings make it clear that the rejectable men show a strikingly higher tendency to be attacked by caries than the acceptables. It follows, therefore, that the rejectables display a significantly higher intrinsic or potential need for fillings than the acceptables.

FILLED CARIES EXPERIENCE

The number of filled teeth and filled surfaces found in the rejectables and in the acceptables are shown in tables 2 and 3. The rejectables aged 21 years show 1 filled tooth and 1.5 filled surfaces per man, while the acceptables of this age show 1.8 filled teeth and 2.9 filled surfaces.

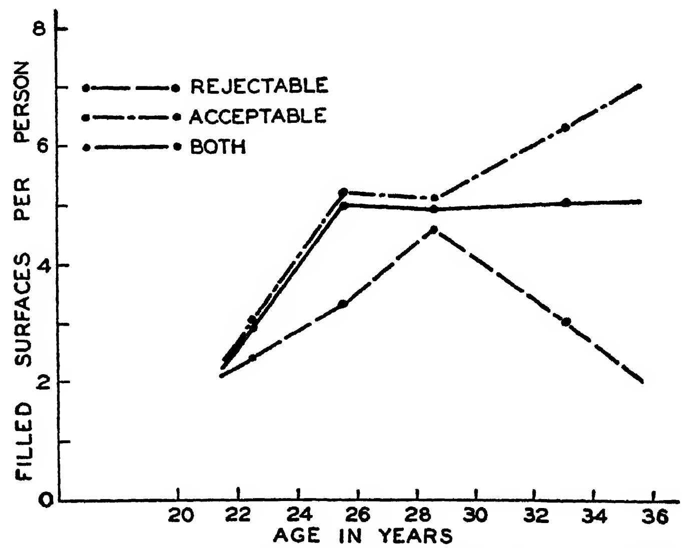


FIGURE 2.—Chronological age and the number of filled tooth surfaces per person. The plotted points represent averages for the age groups 21–23, 24–26, 27–29, and 30–35 years.

In general, over the interval from 21 through 35 years of age, there is only a slight increase in the number of filled teeth, as shown in figure 2.

The disparity between the rate of development of caries and the rate of supply of dental care in the form of fillings may be further appreciated by comparing the data on the potential need for fillings with that on the actual number of fillings found. This comparison can be made from the figures given in tables 2 and 3. Thus in 21-year-old rejectables only about one-twentieth of the teeth with caries experience show fillings (1 filled tooth of 19.2 DMF teeth) while in the acceptables of the same age about one-fifth of the teeth with caries experience show fillings (1.8 filled teeth of 9.8 DMF teeth). The disparity in each group is not reduced to any large extent during the interval between 21 and 35 years of age. For the ages 21–35 years, the rejectables show fillings in approximately one-tenth of their

DMF teeth and one twenty-seventh of their DMF surfaces, while the acceptables have received treatment by fillings for about one-fourth of their DMF teeth and approximately one-seventh of their DMF surfaces. Expressed in other terms, only a portion of the intrinsic need for fillings is supplied rejectables or acceptables. However, a higher proportion of the intrinsic need of the acceptables has been filled than in the case of the rejectables.

Although the acceptables receive, per tooth attacked by caries, more treatment by fillings than the rejectables, the acceptables receive per man about the same amount of fillings as the rejectables.[7] This finding, coupled with the observation that the rejectables have a considerably higher intrinsic need, leads to the view that the absolute number of fillings placed per man is not closely determined by the level of intrinsic need. Thus, men having high and men having relatively lower caries tendencies, both receive, on the average, about the same amount of dental care in the form of filled permanent tooth surfaces.

The similarities and the differences between the rejectables and acceptables with respect to the volume of treatment by fillings are shown in table 5. For example, no rejectable has more than 14 filled teeth while 3.9 percent of the acceptables have from 14 to 24 filled teeth. On the other hand, 54 percent of the rejectables and about the same percentage of the acceptables have no filled teeth in spite of the fact that, as shown earlier, 100 percent of the rejectables have 7 or more DMF teeth and 97 percent of the acceptables have one or more DMF teeth.

When the range of fillings supplied is obtained in terms of tooth surfaces, it is found that no rejectable has more than 26 filled surfaces and only about 2.5 percent of the acceptables have from 27 to 45 filled surfaces. The acceptables and rejectables are rather similar with regard to the percentage of men having no filled surfaces since 54 percent of the rejectables and about the same percentage of acceptables have no filled surfaces.

THE RESIDUUM OF UNFILLED CARIES EXPERIENCE

From the foregoing, it is apparent that the tendency to receive dental care in the form of fillings falls considerably below the tendency to experience caries, for both the rejectables and acceptables. The consequences of this disparity between the development of need for fillings and the receipt of fillings is reflected in a large residuum of current dental need, that is, carious teeth and tooth surfaces requiring fillings and carious teeth requiring extraction. These latter, together with carious teeth already extracted, produce the need for

[7] Obviously, fillings which may have been placed in teeth which later were removed from the mouth would not be counted among the filled teeth. However, it does not appear likely that more fillings would

prosthetic replacements. Since both groups of men have roughly the same number of filled surfaces per man, the group having the higher caries tendency (the rejectables) would be expected to show a much larger residuum of unfilled caries experience.

TABLE 5.—*Number and accumulated percentage of men having specified numbers of filled teeth and filled surfaces. Data arranged by acceptable and rejectable groups for the chronological ages 21–35 years, inclusive, and derived from examination of 642 men of West Virginia and Maryland*

Number of filled teeth	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage
32	------	------	------	------
31	------	------	------	------
30	------	------	------	------
29	------	------	------	------
28	------	------	------	------
27	------	------	------	------
26	------	------	------	------
25	------	------	------	------
24	1	0.2	------	------
23	0	0.2	------	------
22	0	0.2	------	------
21	0	0.2	------	------
20	0	0.2	------	------
19	2	0.6	------	------
18	1	0.7	------	------
17	3	1.3	------	------
16	5	2.2	------	------
15	3	2.8	------	------
14	6	3.9	1	1.0
13	4	4.6	0	1.0
12	8	6.1	1	2.1
11	7	7.3	0	2.1
10	9	9.0	1	3.1
9	6	10.1	2	5.2
8	9	11.7	3	8.2
7	12	13.9	1	9.3
6	12	16.1	2	11.3
5	20	19.8	8	19.6
4	18	23.1	7	26.8
3	29	28.4	6	33.0
2	45	36.7	5	38.1
1	42	44.4	7	45.4
0	303	100.0	53	100.0
All	545	------	97	------

Number of filled surfaces	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage
45	1	0.2	------	------
44	0	.2	------	------
43	0	.2	------	------
42	0	.2	------	------
41	0	.2	------	------
40	0	.2	------	------
39	1	.4	------	------
38	0	.4	------	------
37	1	.6	------	------
36	1	.7	------	------
35	0	.7	------	------
34	0	.7	------	------
33	1	.9	------	------
32	3	1.5	------	------
31	0	1.5	------	------
30	2	1.8	------	------
29	1	2.0	------	------
28	1	2.2	------	------
27	1	2.4	------	------
26	2	2.8	1	1.0
25	3	3.3	0	1.0
24	3	3.9	0	1.0
23	4	4.6	1	2.1
22	2	5.0	0	2.1
21	4	5.7	0	2.1
20	2	6.1	0	2.1
19	3	6.6	0	2.1
18	5	7.5	0	2.1
17	7	8.8	0	2.1
16	4	9.5	0	2.1
15	2	9.9	2	4.1
14	1	10.1	0	4.1
13	3	10.6	1	5.2
12	4	11.4	0	5.2
11	4	12.1	2	7.2
10	7	13.4	3	10.3
9	12	15.6	2	12.4
8	12	17.8	0	12.4
7	10	19.6	4	16.5
6	12	21.8	9	25.8
5	16	24.8	3	28.9
4	25	29.4	5	34.0
3	22	33.4	4	38.1
2	37	40.2	4	42.3
1	23	44.4	3	45.4
0	303	100.0	53	100.0
All	545	------	97	------

Carious teeth and tooth surfaces requiring fillings.—The numbers of teeth and tooth surfaces carious and requiring fillings are given in tables 2 and 3. At 21 years of age the rejectables show a current need of close to 5 teeth and more than 6 surfaces filled per man. At this age, the acceptables have a current need of more than 5 teeth and more than 7 surfaces filled per man. From study of the changes

with advancing age in the number of teeth and surfaces carious and requiring filling it may be noted (figure 3) that the numbers of these teeth and surfaces per man decrease more in the rejectable group than in the acceptables. This finding justifies some consideration.

It is clear that teeth, and particularly tooth surfaces, which are carious and require fillings represent the *current need for fillings* as observed on examination. The current need for fillings is obviously and basically determined by the intrinsic or potential need for fillings which has its basis in turn in the tendency to experience caries.

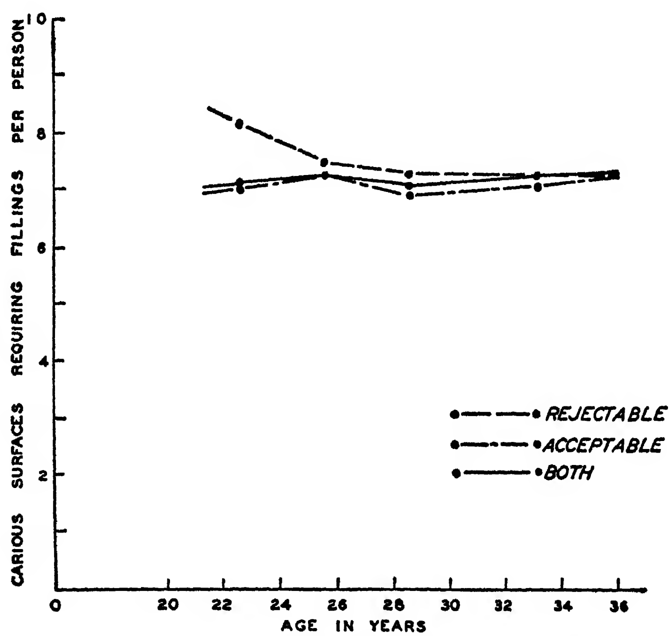


FIGURE 3.—Chronological age and the number of carious tooth surfaces requiring fillings per person. The plotted points represent averages for the age groups 21–23, 24–26, 27–29, and 30–35 years.

From the foregoing discussion it is clear that the current need for fillings represents that first part of the residuum of filled carious experience (DMF surfaces) which is still amenable to treatment by fillings.

From knowledge of present clinical practice it is clear that dental treatment for caries can take two main forms, (*a*) the filling of carious lesions and (*b*) the extraction of extensively carious teeth. Thus the current need for fillings may be reduced either by filling carious surfaces or by extracting carious teeth, or by both procedures. From the material presented in table 2, it becomes evident that there is a marked tendency among the rejectables to have teeth extracted. Thus the finding of a reduction in current need for fillings with advancing age

for the rejectables is explained in large part by a high tooth extraction rate.

As shown by the frequencies given in table 6, the acceptable group tends to have available greater numbers of surfaces requiring filling than is the case for the rejectables. For example, among the 545 acceptables, one man requires 42 surfaces filled and 3 men need fillings in 27 surfaces. Among the 97 rejectables, none of the men require more than 25 surfaces filled. However, the general similarity in the range of current need for fillings in both groups is indicated by the finding that approximately 52 percent of the acceptables need from 6 to 27 surfaces filled while about the same percentage of the rejectables (58.8 percent) need from 6 to 25 surfaces filled. Throughout the age interval 21–35 years, the rejectables and acceptables show, on the average, a similar current need for fillings—5 teeth and 7 surfaces requiring fillings per man for each group.

TABLE 6.—*Number and accumulated percentage of men having specified number of carious tooth surfaces requiring fillings. Data arranged by acceptable and rejectable groups for the chronological ages 21–35 years, inclusive, and derived from examination of 642 men of West Virginia and Maryland*

Number of surfaces carious, requiring fillings	Acceptables		Rejectables		Number of surfaces carious, requiring fillings	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage		Number	Accumulated percentage	Number	Accumulated percentage
42	1	0.2			19	2	4.4	1	4.1
41	0	.2			18	7	5.7	1	5.2
40	0	.2			17	5	6.6	2	7.2
39	0	.2			16	12	8.8	2	9.3
38	0	.2			15	12	11.0	5	14.4
37	0	.2			14	17	14.1	5	19.6
36	0	.2			13	17	17.2	1	20.6
35	0	.2			12	12	19.4	3	23.7
34	0	.2			11	20	23.1	4	27.8
33	0	.2			10	17	26.2	6	34.0
32	0	.2			9	24	30.6	4	38.1
31	0	.2			8	33	36.7	7	45.4
30	0	.2			7	43	44.6	3	48.5
29	0	.2			6	42	52.3	10	58.8
28	0	.2			5	56	62.6	10	69.1
27	3	.7			4	34	68.8	6	75.3
26	3	1.8			3	46	77.2	4	79.4
25	0	1.3	1	1.0	2	44	85.3	5	84.5
24	3	1.8	0	1.0	1	36	91.9	3	87.6
23	1	2.0	0	1.0	0	44	100.0	12	100.0
22	6	3.1	1	2.1					
21	2	3.5	0	2.1	All	545		97	
20	3	4.0	1	3.1					

Carious teeth requiring extraction.—The status of the men with respect to this second ingredient for the residuum of unfilled caries experience is shown in tables 2 and 3. The rejectables at age 21 years have more than three teeth indicated for extraction. The acceptables of this age require the extraction of only a fraction of a tooth per man.

With advancing chronological age the rejectables tend to have fewer teeth requiring extraction than the acceptables. Through study of the tooth extraction data shown in table 2, the conclusion may be

reached that the reduction with age in need for extractions among the rejectables is explained by the fact that they have had a large number of teeth extracted.

That the range of this need is quite different for rejectables and acceptables is indicated in table 7. From these data it may be noted that 8.2 percent of the rejectables require extraction of from 10 to 19 carious teeth. Among the acceptables no man requires extraction of more than 9 carious teeth. More than 40 percent of the rejectables require the extraction of 1 or more carious teeth while about 30 percent of the acceptables show this need. Table 2 shows that throughout the age interval 21–35 years, the rejectables have more than 2 carious teeth requiring extraction, while the acceptables in this age range show less than 1 carious tooth requiring extraction.

TABLE 7.—*Number and accumulated percentage of men having specified numbers of teeth indicated for extraction. Data arranged by acceptable and rejectable groups for the chronological ages 21–35 years, inclusive, and derived from examination of 642 men of West Virginia and Maryland*

Number of teeth indicated for extraction	Acceptables		Rejectables		Number of teeth indicated for extraction	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage		Number	Accumulated percentage	Number	Accumulated percentage
19			1	1.0	8		0.2	1	10.3
18			2	3.1	7	6	1.3	3	13.4
17			0	3.1	6	4	2.0	4	17.5
16			0	3.1	5	8	3.5	3	20.6
15			0	3.1	4	18	6.8	2	22.7
14			0	3.1	3	20	10.5	2	24.7
13			1	4.1	2	39	17.6	8	33.0
12			3	7.2	1	68	30.1	10	43.3
11			0	7.2	0	381	100.0	55	100.0
10			1	8.2					
9	1	0.2	1	9.3	All	545		97	

Extracted teeth.—The status of the men with respect to this third ingredient of the residuum of unfilled caries experience is shown in table 2. At 21 years of age the rejectables have had more than 10 teeth extracted per man, while the acceptables have had less than 3 extracted. With advancing chronological age both groups tend to have new increments of extracted teeth. For the ages 21–35 years, the rejectables have had 13 teeth extracted per man and the acceptables less than 3.

Current need for dentures and bridges.—When the extracted teeth are added to those indicated for extraction, the rejectables have 15 teeth extracted and indicated for extraction [8] which need to be replaced per man, while the acceptables have less than 4 such teeth per man.

In making the dental examinations on which the present report is based, no attempt was made to diagnose the particular type of prosthetic appliance best suited to particular individuals. The considera-

tions on which this decision was based are readily apparent. It is clear that a variety of prosthetic appliances may be recommended for a particular need. The choice of a particular type, whether bridge or partial denture, whether of precious or semiprecious metal, of vulcanite or the more modern plastics, is largely determined by the wishes of the patient, his capacity to purchase simple or expensive appliances, and by the opinion of the dentist concerned.

With the view of circumventing these more or less extrinsic variables which find an important place in determining the type and complexity of a particular appliance which might be recommended, the need for such appliances is deliberately not expressed in a direct form. Thus the information given in the present report provides rather data on the number of men having particular numbers of teeth needing replacement. From these data the need for prosthetic appliances may be interpreted. Obviously, men having 32 missing teeth would require full upper and lower dentures. Men who have fewer than 32 and more than 6 teeth extracted and indicated for extraction may be considered to require some type of partial denture or dentures. It is clear that the need for particular types of appliances is clearly not established by these data. On the other hand, it is reasonable to assume that men having as few as 1 to as many as 6 extracted teeth and indicated extractions require bridges rather than dentures and that men having more than 6 extractions and indicated extractions and fewer than 32 such teeth need partial dentures or their equivalents in bridges.

The status of the rejectables and acceptables with regard to the need for these various broadly classified types of prosthetic replacements may be interpreted from the data given in table 8. Extractions and indicated extractions are found in all rejectables, as would be expected on the basis of the criteria establishing rejectability. About half of the rejectables have from 3 to 13 teeth extracted and indicated for extraction and the remaining half of the rejectables have from 14 to 32 such teeth. It follows, therefore, that the rejectables all might be expected to require either full upper and lower dentures or partial dentures, or bridges. That a few of the rejectables have this need either completely or partially supplied will be shown later.

In contrast to these findings on the rejectables, approximately 18 percent of the acceptables have no missing teeth and no acceptable has more than 13 missing teeth. About half of the acceptables have from 3 to 13 teeth extracted and indicated for extraction, and of the remaining half about one-third have no tooth loss and two-thirds have only 1 or 2 missing teeth. Thus the prosthetic problem in the acceptables involves, in the main, bridges and partial dentures. The acceptables show no need for full dentures.

TABLE 8.—*Number and accumulated percentage of men having specified numbers of teeth extracted and indicated for extraction. Data arranged by acceptable and rejectable groups and derived from examination of 642 men of West Virginia and Maryland*

Number of teeth extracted and indicated for extraction	Acceptables		Rejectables		Number of teeth extracted and indicated for extraction	Acceptables		Rejectables	
	Number	Accumulated percentage	Number	Accumulated percentage		Number	Accumulated percentage	Number	Accumulated percentage
32			6	6.2	14			9	51.5
31			0	6.2	13	2	0.4	8	59.5
30			1	7.2	12	3	.9	12	72.2
29			0	7.2	11	6	2.0	5	77.3
28			0	7.2	10	12	4.2	12	89.7
27			0	7.2	9	16	7.2	4	93.8
26			0	7.2	8	16	10.1	4	97.9
25			3	10.3	7	28	15.2	0	97.9
24			0	10.3	6	37	22.0	1	99.0
23			2	12.4	5	43	29.9	0	99.0
22			2	14.4	4	58	40.6	0	99.0
21			2	16.5	3	62	51.9	1	100.0
20			3	19.6	2	82	66.9		
19			5	24.7	1	81	81.8		
18			3	27.8	0	99	100.0		
17			10	38.1					
16			2	40.2	All	545		97	
15			2	42.3					

The frequency distributions shown in table 8 give the status of tooth loss, actual and imminent, without providing information on the amount of prosthetic replacement which has already been supplied these men. In making the dental examinations, specific inquiries were made with regard ~~to~~ whether or not a man having missing teeth had had a prosthetic appliance already made. Among the 97 rejectables, all of whom show 3 or more missing teeth, 21 men had such replacements. Of these 21 men, there were 6 who had no natural teeth (32 missing), and of these 6 men, 5 had had full upper and lower dentures supplied, and 1 man had a full upper but was not supplied with a full lower. The remaining 15 men were partially edentulous. Thirteen of them wore full upper plates and needed partial lowers, or wore upper bridges and needed lower bridges. Two of these 15 men had had their need for partial upper and lower dentures completely supplied. Accordingly, of the 21 men having prosthetic appliances, only 7 men had had their need for full dentures or partial plates or bridges completely supplied. It follows, therefore, that of the 97 rejectables, of whom all show enough missing teeth to require appliances, 90 show an existing, incompletely supplied need for such appliances. Hence, of every 10 rejectables examined, 9 show a current unsupplied need for partial prosthetic replacement. It is of interest to note that men without any natural teeth tend to have their need for prosthesis supplied more readily than those men who have fewer than 32 missing teeth.

The data shown in table 8 reveal that close to 82 percent of the acceptables have enough missing teeth to justify having partial plates or bridges. Thus, of the 545 acceptables, 446 would be justified in

wearing partial plates or bridges. Of these 446 men, only 5 had been supplied with such appliances at the time of examination. Of these 5 men, only 1 had had his need completely serviced (an upper anterior two-tooth bridge). Three of these 5 men were wearing upper bridges and showed an unsupplied need for an appliance in the lower jaw. The remaining man had a partial upper plate and showed an unsupplied need for a partial lower denture. Thus of the 5 men having appliances, 4 remained incompletely serviced. It follows, therefore, that more than 9 out of every 10 acceptables show an incompletely supplied need for partial plates and bridges.

Dental rehabilitation of the rejectables.—From the findings given earlier it is clear that a group of men who would be accepted according to Selective Service dental criteria for full military duty (the acceptables) present a large current need for dental reparative services. Obviously, the dental needs shown by the men who would be rejected are larger than those displayed by the acceptables.

It would be interesting to know the number of rejectables who could be classed acceptable (1–A) and the number who could be classed 1–B if their missing dental structures were sufficiently reconstituted by prosthetic appliances to meet the minimal dental requirements for these classifications. A full consideration of this question cannot be given here since only 97 rejectables were encountered. Nevertheless, a statement with respect to the number of the rejectables who could be classed 1–A or 1–B would appear to be justified.

Study of the dental status of the 97 rejectables indicates that the placement of dental fixed bridgework in 49 of these men would probably justify their being placed in class 1–A. The remaining 48 men could be placed in class 1–B if partial and full dentures were supplied to them.

COMMENT

It is clear that the rejectable men have a more pronounced tendency to be attacked by caries than the acceptables. It may be noted, for example, that per man the rejectables have more missing teeth (extractions and indicated extractions) than the acceptables have teeth attacked by caries (DMF). Rejectables, as determined by Selective Service requirements, therefore tend to be those men who are high in caries susceptibility. On the other hand, the acceptables, although lower in susceptibility, have a considerable caries tendency. For example, it is clear that the acceptables have a caries susceptibility sufficient to render their current volume of carious surfaces needing fillings approximately equal in magnitude to that shown by the rejectables. Furthermore, the acceptables need a considerable amount of dental bridgework.

200325°—41——3

The present situation, that is, the existing profound loss of masticating function in the rejectables and the large volume of reparative services in the form of fillings, dentures, and bridges currently needed by both the rejectables and acceptables, arises in the main from a long-continued yearly accumulation of untreated carious teeth and tooth surfaces which have been piling up each year in the permanent teeth

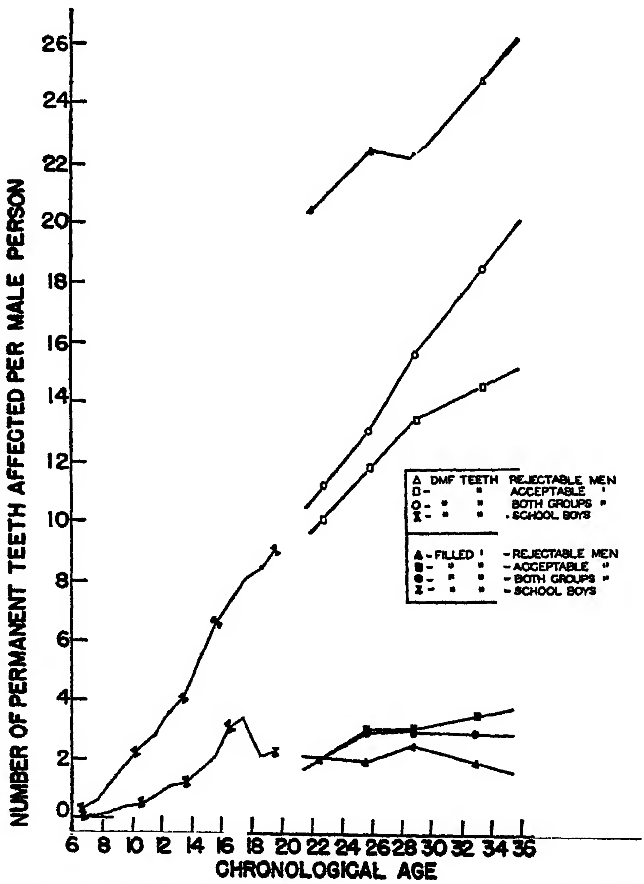


FIGURE 4 —Chronological age and the number of DMF permanent teeth and the number of filled permanent teeth per person Data derived from examination of approximately 3,000 elementary and high school boys of Hagerstown, Md , and environs, and of approximately 640 youths aged 21–35 years in Maryland and West Virginia

of the men since they were about 6 years of age. It is clear that a large disparity has long existed and still exists between the rate of development of carious lesions and the rate at which these lesions are serviced by fillings in both the acceptables and the rejectables. The character of this disparity is revealed graphically in figure 4, which shows the way in which teeth experiencing caries attack and teeth experiencing treatment by fillings accumulate in a population of

approximately 3,000 elementary and high schools boys of Hagerstown, Md. The rate of attack of the permanent teeth by caries may be seen to exceed by a large margin the rate at which the teeth are filled at the ages of 6 to 19 years, inclusive.

The manner in which teeth attacked by caries accumulate in the mouths of the 642 men whose dental findings are described in this report is shown by the trend line marked with small open circles in figure 4. In the lower right hand area of this figure are the trend lines which show the way in which filled teeth accumulate in the mouths of these men (the line shown with small closed circles). The tremendous disparity between the rate of provision of dental care in the form of fillings and the rate of attack by caries is clearly apparent from this graph. This figure also indicates that the disparity continues to widen with advancing chronological age. It is evident that, though a large disparity exists for the acceptable men, the disparity for the rejectables is almost twice that of the acceptables.

It is well known that the prompt placement of fillings during school attendance would have prevented a large share of the tooth loss observed in the men. Although knowledge is not sufficient for the prevention of initiation of caries, the procedures of dentistry are sufficient to prevent dental rejectability even in persons having marked caries susceptibility. If the prevention of dental rejectability be set up as an objective, it would be necessary to begin, at least at age 6, filling the teeth annually at a rate coincident with the rate at which carious lesions arise. To reiterate, it is necessary to recognize that a new crop of caries develops each year in the permanent teeth from about age 6 until practically all susceptible tooth surfaces have been attacked in late adult life. Thus the prevention of rejectability (as now defined) and the prevention of the excessive accumulation of need for fillings, and of dentures and bridges, in the rejectables and acceptables requires, until dental caries actually can be prevented, a systematic, perennial dental servicing problem, beginning in the first decade of life and continuing without interruption through the late adult ages.

SUMMARY

The dental status and dental needs arising from caries of a group of 97 men who would be rejectable for full military duty according to Selective Service requirements, and those of a group of 545 men who would be acceptable, are summarized graphically in figure 5.

Dental status.—Per rejectable man (aged 21–35 years) more than 22 permanent teeth have been attacked by caries (DMF). Of these 22 teeth showing evidence of caries experience, 13 are already extracted,

2 need to be extracted, 2 have been filled, and 5 are carious and justify treatment by fillings.

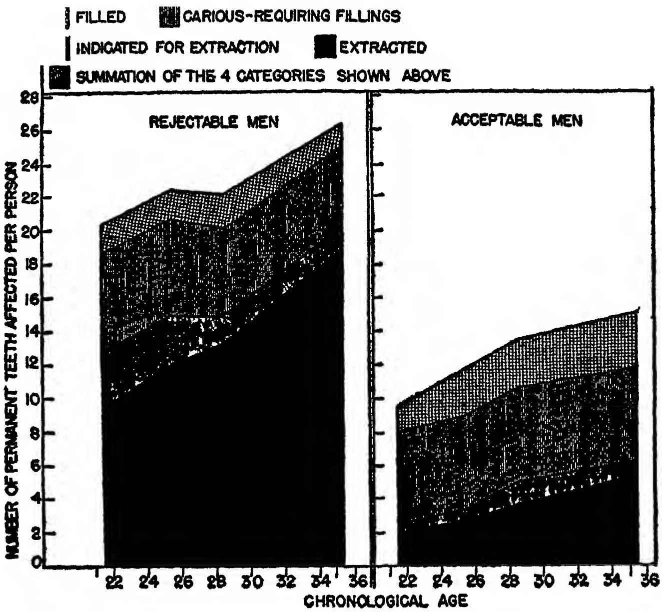


FIGURE 5.—Chronological age and the number of permanent teeth affected by the several categories of caries experience, per rejectable and per acceptable man. Data derived from examination of approximately 640 youths aged 21-35 years in Maryland and West Virginia.

Per acceptable man (aged 21–35 years) 11 permanent teeth have been attacked by caries (DMF). Of these 11 teeth showing evidence of caries experience, 3 teeth are already extracted, less than 1 tooth needs to be extracted, 2 have been filled, and more than 5 are carious and justify treatment by fillings.

Dental needs.—Per rejectable man (aged 21–35 years), 2.4 teeth are carious to such an extent as to require extraction, 7.6 tooth surfaces need to be filled, 13 teeth have been extracted, 2.4 teeth require extraction, and 9 out of every 10 of these rejectables need full or partial dentures.

Per acceptable man (aged 21–35 years), 0.7 of a tooth is carious to such an extent as to require extraction, 7.1 tooth surfaces need to be filled, about 2.5 teeth have been extracted, 0.7 of a tooth requires extraction, and 9 out of every 10 of the acceptables need partial dentures or bridges.

ACKNOWLEDGMENTS

The collection of the material for the present report was made possible through the cooperation of Mr. George St. J. Perrott, Chief of the Division of Public Health Methods, National Institute of Health,

and Dr. C. E. Rice, Health Consultant of the National Youth Administration. The cooperation of Mr. Benjamin C. Willis, Superintendent of Education, Dr. W. R. Willard, Deputy State Health Officer, and Mr. Earl D. Huyett, Director of Vocational Education, all of Washington County, Md., and of Dr. W. Ross Cameron, Director of Joint Committee on Medical Care, State of Maryland, and Dr. Antonio Ciocco, Chief of the Hagerstown Field Station of the Child Hygiene Office, National Institute of Health, is gratefully acknowledged.

The data pertaining to the men of West Virginia were obtained through the assistance of Mr. Glenn S. Callaghan, National Youth Administrator for the State of West Virginia, and through the cooperation of Dr. P. J. McGucken, Dentist, and Mr. Jacob Fullmer, Supervisor, of the South Charleston (West Virginia) Resident Center of the National Youth Administration.

All of the dental examinations were made with mouth mirrors and explorers by Dr. John F. Cody, Assistant Dental Surgeon (R), of the National Institute of Health, to whom special thanks are due.

To Dr. Carroll E. Palmer, Passed Assistant Surgeon, United States Public Health Service, appreciation is expressed for continued support and encouragement in the collection and analysis of the data.

REFERENCES

(*1*) Klein, Henry, and Palmer C. E.: Dental Caries in American Indian Children. Pub. Health Bull. No. 239, U. S. Government Printing Office, Washington, 1937.

(*2*) Klein, Henry, Palmer, C. E., and Knutson, J. W.: Studies on dental caries. I. Dental status and dental needs of elementary school children. Pub. Health Rep., **53:** 751–765 (1938).

(*3*) Klein, Henry, and Palmer, C. E.: Studies on dental caries. IX. The prevalence and incidence of dental caries experience, dental care and carious defects requiring treatment in high school children. Pub. Health Rep., **55:** 1258–1268 (1940).

(*4*) Klein, Henry, and Palmer, C. E.: Studies on dental caries. X. A procedure for the recording and statistical processing of dental examination findings. J. Dent. Research, **19:** 243 256 (1940).

(*5*) Klein, Henry, and Palmer, C. E.: On the Epidemiology of Dental Caries. Symposium on Dental Caries. Bicentennial Conference, University of Pennsylvania. University of Pennsylvania Press, Philadelphia (1940).

(*6*) Hollander, F., and Dunning, J. M.: A study by age and sex of the incidence of caries in over 12,000 persons. J. Dent. Research, **18:** 43–60 (1939).

(*7*) Cheyne, V. D., and Drain, C. L.: Dental caries and permanent tooth extraction. J. Dent. Research, **19:** 571–584 (1940).

(*8*) Dean, H. T.. Jay, P., Arnold, F. A., McClure, F. J., and Elvove, E.: Domestic water and dental caries, including certain epidemiological aspects of oral *L. acidophilus*. Pub. Health Rep., **54:** 862 (1939).

(*9*) Pedersen, P. L.: Dental caries in more than 1,200 rural school children of Denmark. Tandlaege Bladet., **43:** 257–295 (1939).

(*10*) Salzmann, J. A.: A study of orthodontic and facial changes and effects on dentition attending the loss of first molars in five hundred adolescents. J. Am. Dent. Assoc., **25:** 892-905 (1938).

(*11*) Sloman, E. G., and Sharp, J. B.: Extent of dental caries and condition of teeth of San Francisco high school children. J. Calif. State Dent. Assoc., **16:** 1–32 (1940).

PROTECTIVE ANTIBODIES AGAINST ST. LOUIS ENCEPHALITIS VIRUS IN THE SERUM OF HORSES AND MAN[1]

By CORNELIUS B. PHILIP, *Medical Entomologist*, and HERALD R. COX, *Principal Bacteriologist, United States Public Health Service*, and JOHN H. FOUNTAIN, *Weld County Health Office, Greeley, Colo.*

During the late summer and fall of 1940 an epidemic of encephalitis in man and horses occurred in Weld County, northern Colorado. Epidemiological considerations have been summarized by the authors.[2]

Since the onset of the human cases occurred during the summer months at a time when some 50 horses in the same community were afflicted, it was thought likely that equine encephalomyelitis (E. E.) virus was the causative agent, but preliminary tests carried out with a number of convalescent human serums suggested this was not the case. Moreover, on further test, a number of these serums showed protective antibodies against St. Louis encephalitis virus. In view of these findings a number of human and horse serums were tested for protective antibodies against both St. Louis encephalitis virus and the western type of E. E. virus. The object of this preliminary note is to report the results of the laboratory tests as carried out by one of us (H. R. C.) up to the present time.[3]

Serum-protection tests were carried out in mice (Swiss strain albinos) by the standard intracerebral technique. The serum-virus mixtures were held at 37° C. for 2 hours and then placed in the cold room at 4° C. overnight. In some of the preliminary tests 3 mice were injected with each serum-virus mixture; thereafter 4 mice were always used. The St. Louis encephalitis strain of virus was obtained from Dr. Charles Armstrong, of the National Institute of Health, while the W. E. E. strain was received from Dr. Carl Ten Broeck, of the Rockefeller Institute, Princeton, N. J. Known negative and positive serums were always included with each series of tests.[4] Those serums that showed protection or suggestive evidence of it were always retested at least once for purposes of confirmation; some were tested twice or 3 times. Only those serums that showed protection against at least 10 to 100 minimal lethal doses of virus were considered positive. A number of both human and horse serums showed protection against as many as 100 to 1,000 lethal doses.

---

[1] Contribution from the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

[2] C. B. Philip, H. R. Cox, and J. H. Fountain: J. Parasitol., 26 (Suppl.): 24 (December 1940).

[3] Due acknowledgments to those physicians, veterinarians, and others who so kindly cooperated in this study will be given in a later paper.

[4] We are indebted to Dr. C. G. Harford, Washington University, St. Louis, and Miss Beatrice Howitt, George Williams Hooper Foundation, University of California, San Francisco, for sending us immune rabbit serum specific for the St. Louis encephalitis and W. E. E. strain of viruses, respectively. No cross-immunity reactions occurred with these specific antiserums, thus confirming the earlier observations of Cox and Fite (Proc. Soc. Exp. Biol. and Med., 31: 499 (1934)) that there apparently is no immunological relationship between the St. Louis encephalitis and W. E. E. viruses.

Human serums from fourteen 1940, two 1939, and three 1938 cases diagnosed as encephalitis were tested, as were the following additional serums taken in the same area (all collected during the fall of 1940) from: (*a*) A 1938 human case diagnosed as poliomyelitis; (*b*) 5 members of families in which cases occurred during the 1940 outbreak (these are called family contacts; see table 1); (*c*) 3 physicians who treated patients during the 1940 epidemic and thus had contact exposure; (*d*) 6 veterinarians who treated and autopsied a number of horses supposedly affected with encephalomyelitis that occurred in 1938, 1939, and 1940; and (*e*) 7 horses that were afflicted during the 1940 epizootic. Table 1 summarizes the data concerning the serums tested.

TABLE 1.—*Protection tests on human and horse serums collected in Colorado*

Serums tested	Total number tested	Strain of virus: W. E. E. Number serums positive	W. E. E. Number serums negative	St. Louis Number serums positive	St. Louis Number serums negative	Number of serums positive for both viruses
Human cases, 1940	14	1	13	7	7	1
Human cases, 1939	2	0	2	2	0	0
Human cases, 1938	3	[1] 1	2	2	[1] 1	0
1938 poliomyelitis case	1	0	1	0	1	0
Family contacts	5	0	5	1	4	0
Physicians	3	0	3	0	3	0
Veterinarians	6	0	6	4	2	0
Horses	7	5	2	7	0	5

[1] Serum tested from this patient in 1938 by Dr. Charles Armstrong, of the National Institute of Health, showed positive protection against W. E. E. virus. The serum tested here was taken in the fall of 1940.

Of the fourteen 1940 human cases tested, 7 showed protection against St. Louis virus. One of these 7 also gave equal protection against W. E. E. virus. Of the 5 encephalitic serums from persons ill in 1938 and 1939, 4 showed protection against St. Louis virus, the fifth against W. E. E. virus. This last case showed protection against the same virus in 1938 (see table 1). Serum taken from the poliomyelitis case of 1938 failed to neutralize either virus. One of the 5 family contacts showed protection against St. Louis virus alone. None of the 3 physicians showed protection against either virus although 2 were suspected of having had abortive cases of encephalitis. Four of the 6 veterinarians showed good protection against St. Louis virus, none against W. E. E. virus. Two of these were suspected of having had abortive (untreated) attacks of encephalitis. Five of the 7 horse serums protected equally against St. Louis and W. E. E. viruses. Two protected against St. Louis virus only. It may be of significance that veterinarians in the Colorado area frequently report "reinfections of encephalomyelitis" in horses in different seasons or years.

In view of these results, it was deemed necessary to test the serums of supposedly normal horses as well as the serums of horses recovered from attacks of encephalitis in parts of the country other than Colorado. Several such serums have been collected and tested with the results shown in table 2.

TABLE 2.—*Protection tests on horse serums collected in Montana and Washington*

Serums tested	Total number tested	Strain of virus				Number of serums positive for both viruses
		W. E. E.		St. Louis		
		Number serums positive	Number serums negative	Number serums positive	Number serums negative	
Montana horses with no previous history of encephalitis	5	2	3	2	3	2
Montana horses recovered from encephalitis	3	3	0	3	0	3
Washington horses recovered from encephalitis	3	3	0	3	0	3

Of 5 Montana horses with no previous history of encephalitis, 2 showed protection against both viruses while the remaining 3 showed no protection against either virus. All of the above horses were from the Bitterroot Valley in western Montana where epidemics of equine encephalomyelitis occurred in 1936 and 1937.[5] The 2 horses that showed protection were in the valley at the time of the above-mentioned epidemics and it is possible that they then suffered immunizing infections without showing frank clinical signs of disease. The 3 horses that failed to show protection were foaled from a year to 2 years after the above-mentioned outbreaks. The 3 Montana horses with definite histories of encephalitis were ill in September 1936, August 1937, and May 1940. All 3 showed protection against both viruses. The 3 Washington horses were from the vicinity of Ellensburg and Yakima, in which locality an epidemic of encephalitis affecting both man and horses occurred in the fall of 1940. All 3 were 1940 recoveries and all showed protection against both viruses.

The implications of the above findings are too far reaching to be discussed here. However, the above data definitely suggest that horses as well as man are susceptible to immunization by St. Louis encephalitis virus and that epidemics of encephalitis affecting both man and horses during the summer months [6] may be caused by this virus as well as by the known strains of E. E. virus.

Muckenfuss [7] reported tests of the susceptibility of "6 horses and mules" in which 2 of the latter animals developed febrile reactions,

[5] H. R. Cox, C. B. Philip, H. Marsh, and J. W. Kilpatrick: J. Am. Vet. Med. Assoc., 93: 225 (October 1938).

[6] One of the cases among horses in Colorado and one in Montana that showed protection occurred in May.

[7] Bull. N. Y. Acad. Med., 10: 451 (July 1934). See also Pub. Health Bull. No. 214, p. 33 (1935).

and 1 showed suggestive microscopic lesions in the brain. However, attempted passage to another animal was not successful.

Additional work is now in progress to determine whether horses are susceptible to St. Louis encephalitis virus under experimental conditions.

SUSCEPTIBILITY OF HORSES TO ST. LOUIS ENCEPHALITIS VIRUS [1]

By HERALD R. COX, *Principal Bacteriologist*, and CORNELIUS B. PHILIP, *Medical Entomologist, United States Public Health Service*, and J. W. KILPATRICK, *Deputy Veterinarian, Montana State Live Stock and Sanitary Board*, and *Special Consultant, United States Public Health Service*

The finding by Philip, Cox, and Fountain of the presence of antibodies for St. Louis encephalitis virus in the serums of horses and man suggested that this virus exists as a natural infection in horses and is partly responsible for epidemics of summer encephalitis affecting both man and horses.

Three horses were injected intracerebrally with St. Louis encephalitis virus representing 330,000 minimal lethal doses for mice. Blood samples taken prior to inoculation showed two of the horses to possess no antibodies for St. Louis virus while the third protected mice against 10 to 100 lethal doses. None showed antibodies against the western strain of equine encephalomyelitis virus.

Blood samples were taken daily and tested for virus content by injection into mice. Temperatures were taken three times daily. The horse showing natural antibodies remained afebrile during a 28-day observation period and never showed any indication of illness. The second horse showed a sharp temperature rise on the eighth day, accompanied by marked muscular tremors and incoordination. Fever and other signs of illness lasted six days and the horse recovered uneventfully. Blood samples taken after recovery showed neutralizing antibodies only for the St. Louis encephalitis virus. The third horse showed a sharp temperature rise on the ninth day, accompanied by marked symptoms of central nervous disturbance. This animal developed all the symptoms considered typical of equine encephalomyelitis in horses. It rapidly became worse and was sacrificed on the twelfth day. St. Louis encephalitis virus was recovered from the brain and upper cervical cord. No virus was recovered from the blood samples taken daily from the three horses, nor from the spinal fluid, heart, liver, kidneys, spleen, ileum, jejunum, colon, or feces of the sacrificed animal.

---

[1] From the Rocky Mountain Laboratory, Division of Infectious Diseases, National Institute of Health, Hamilton, Mont.

A suspension of the brain and upper cord of the third horse was injected intracerebrally into a fourth horse. Blood samples of the fourth taken prior to injection showed no antibodies to St. Louis virus but its serum protected mice against 1,000 to 10,000 lethal units of western equine encephalomyelitis virus. This horse showed a sharp temperature rise on the eleventh day, accompanied by signs of central nervous disturbance and remained febrile up to the time of complete prostration, which occurred on the twentieth day. During this interval it developed all the clinical symptoms typical of equine encephalomyelitis. This horse was sacrificed and tests are being conducted to determine the presence of virus in the various tissues. No virus was recovered from any of the daily blood samples, but St. Louis encephalitis virus was recovered from nasal washings made on the fifth day of fever.

These studies are being continued, but present data clearly demonstrate that horses are susceptible to St. Louis encephalitis virus, that this virus produces clinical symptoms in horses similar to western equine encephalomyelitis virus, that the virus may be recovered from the brain, spinal cord, and nasal washings of infected animals, and may be transmitted from one horse to another by intracerebral injection of infected brain tissue. Horses that show antibodies for western equine encephalomyelitis virus in high titer are susceptible to St. Louis encephalitis virus, while horses that have acquired St. Louis encephalitis antibodies by natural processes are apparently resistant to subsequent infection.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

May 18–June 14, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended June 14, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The incidence of influenza dropped about 75 percent during the 4-week period ended June 14. The number of cases (5,649) was still more than double the number occurring at this time in 1940, which figure also represents the 1936–40 median. The

excess was largely due to the relatively high incidence in the West South Central region, where the number of cases was almost 3 times the average incidence, and in the Pacific region, where the number of cases was more than 6 times the 1936–40 median figure; minor excesses were reported from the South Atlantic and Mountain regions. The increase in the Pacific region was due to the fact that for the week ended June 7 there were 1,203 cases reported, which were designated as "mostly delayed reports." In the North Atlantic, North Central, and East South Central regions the incidence was considerably below normal.

Measles.—The high incidence of measles since the beginning of the current year reached its peak during the month of April and has since declined in all sections of the country. However, the number of cases for the country as a whole is still the highest on record. For the 4 weeks ended June 14 there were 111,273 cases reported, as compared with approximately 42,000 and 48,000 cases in the years 1940 and 1939, respectively. In the New England and Pacific regions the incidence has dropped below the normal seasonal incidence, but in all other regions the excesses are still very significant. In 1934, 1935, and 1938 the cases for this period totaled approximately 90,000, 91,000, and 80,000, respectively.

Whooping cough.—The number of cases of whooping cough was considerably above the average seasonal incidence. In the Middle Atlantic and West South Central regions the incidence was relatively low, but all other regions reported a comparatively high incidence. For the country as a whole the number of cases (19,798) was the highest recorded for this period in the 4 years for which these data are available.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended June 14 there were 767 cases of diphtheria reported, as compared with 777, 1,022, and 1,260 cases for the corresponding period in 1940, 1939, and 1938, respectively. The current incidence approached the 1940 incidence very closely, but it was only about 60 percent of the 1936–40 median for this period, which is represented by the 1938 figure (1,260 cases). Increases over last year were reported from the West North Central, South Atlantic, West South Central, and Mountain regions, but only the Mountain region reported an excess over the average seasonal incidence.

Meningococcus meningitis.—The number of cases (152) of meningococcus meningitis was about 50 percent in excess of the number occurring at this time in 1940, but it was only about 70 percent of the 1936–40 median (220 cases) for this period. Each geographic region except the Mountain reported an increase over 1940, but only the New England and West South Central reported an increase over the preceding 5-year average incidence.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period May 18–June 14, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	767	777	1,260	5,649	2,685	2,685	111,273	42,424	45,289
New England	13	22	29	6	10	10	6,472	7,291	7,291
Middle Atlantic	140	144	237	23	38	38	37,913	10,115	17,544
East North Central	143	153	239	197	258	304	29,395	7,686	7,686
West North Central	62	51	78	43	35	138	4,496	2,766	2,766
South Atlantic	140	119	173	972	977	517	17,982	2,456	4,157
East South Central	61	47	92	167	225	225	4,771	1,265	1,265
West South Central	86	99	165	1,830	674	705	4,554	4,314	1,738
Mountain	71	61	48	329	229	158	2,992	2,671	1,991
Pacific	51	81	132	2,082	239	309	2,698	3,860	3,860
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	152	98	220	105	179	164	10,056	13,172	13,172
New England	14	6	10	3	2	2	905	719	1,130
Middle Atlantic	41	23	58	14	10	10	3,634	4,768	4,768
East North Central	21	19	31	12	9	12	3,041	5,109	5,109
West North Central	7	4	11	4	7	4	678	747	1,165
South Atlantic	25	17	36	27	7	12	552	529	518
East South Central	12	9	40	10	9	9	449	342	194
West South Central	19	14	14	10	6	10	153	172	267
Mountain	1	2	5	1	6	4	192	197	352
Pacific	12	4	18	24	123	24	452	589	800
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	144	243	839	513	572	804	19,798	14,203	[3] 14,203
New England	0	0	0	25	20	20	1,629	1,040	1,231
Middle Atlantic	0	0	0	90	68	71	3,011	2,585	3,502
East North Central	51	79	166	47	69	87	3,494	2,554	3,288
West North Central	43	90	412	31	49	45	1,379	655	655
South Atlantic	1	4	4	125	102	179	2,931	1,602	2,160
East South Central	20	23	23	47	69	87	789	632	632
West South Central	19	26	41	101	125	167	1,571	1,820	1,820
Mountain	4	17	109	15	25	29	1,400	1,186	839
Pacific	6	4	103	32	45	57	3,584	2,120	2,087

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

Poliomyelitis.—For the current 4-week period, California reported 23 cases of poliomyelitis, Florida, 21 cases, and New York and Illinois, 7 cases each; more than 50 percent of the total of 105 cases reported occurred in those 4 States. The number of cases for the country as a whole was only about 65 percent of the normal seasonal expectancy. A marked increase of poliomyelitis usually occurs during this period of the year, but with the exception of the years 1936 and 1938, when approximately 90 cases were reported for this period in each year, the current incidence is the lowest recorded for this period in 8 years.

Scarlet fever.—A decrease in scarlet fever of approximately 3,800 cases occurred during the current 4-week period as compared with the preceding 4-week period. Comparison with recent years indicates that the incidence was considerably below the normal seasonal level.

For all regions the cases totaled 10,056, as compared with 13,172 cases for the corresponding period in 1940, which figure also represents the 1936–40 average incidence for this period.

Smallpox.—For smallpox the comparison with previous years was very favorable. The number of cases reported was 144, as compared with 243 for the corresponding period in 1940 and a 5-year median of 839 cases. Each region reported a comparatively low number of cases of this disease.

Typhoid fever.—The incidence of typhoid fever was also relatively low. The number of cases (513) reported amounted to about 90 percent of the number reported for this period in 1940 and it was only about 60 percent of the 1936–40 median incidence for the period. The North Atlantic regions reported a few more cases than might normally be expected, but in all other regions the incidence was comparatively low.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended June 14, based on data received from the Bureau of the Census, was 10.9 per 1,000 population (annual basis). The average rate for this period in the years 1938–40 was 11.1 per 1,000 population.

COURT DECISION ON PUBLIC HEALTH

City ordinance regulating hours for operation of barber shops held to delegate legislative power unlawfully.—(Pennsylvania Supreme Court; *Saccone et al.* v. *City of Scranton*, 20 A.2d 236; decided May 12, 1941.) A Pennsylvania statute authorized any municipality, by proper ordinance, to fix the days and hours during which barber shops could be open for business, with a proviso that in any such ordinance provision should be made that a designated local health or police official could, upon application of the proprietor of any barber shop and upon proof that barber service to the public so required, issue a permit effective for a limited time for the operation of a particular barber shop at such times outside of and beyond those fixed in the ordinance as was required by temporary public necessity, with the power to renew such permit upon further proof of public necessity. The city of Scranton, under such statutory authority, passed an ordinance making it unlawful to operate a barber shop, or any place where barbering was done, in the city except during the hours and on the days specified. One section of the ordinance granted power to the department of public safety of the city, upon application of a barber shop proprietor and upon proof that the barber service to the public so required, to issue a permit effective for a limited time, not exceeding thirty days, for the operation of a particular barber shop at such

times other than those fixed in the ordinance as was required by temporary public necessity, with the power to renew the said permit upon further proof of public necessity.

In a suit to restrain the enforcement of the ordinance, the Supreme Court of Pennsylvania passed upon that feature of it which involved an unlawful delegation of legislative power and regarding this said: "That the authority given to the department of public safety is an unlawful delegation of legislative power is clear under all the cases, because there is no standard set up for its guidance." In the course of the opinion the following statement also was made: "Parenthetically, we may observe that it is difficult to understand how the ordinance could be considered a health measure and as such a valid exercise of the police power."

DEATHS DURING WEEK ENDED JUNE 21, 1941

From the Weekly Mortality Index, Issued by the Bureau of the Census, Department of Commerce]

	Week ended June 21, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,810	7,646
Average for 3 prior years	7,518	
Total deaths, first 25 weeks of year	222,371	223,854
Deaths per 1,000 population, first 25 weeks of year, annual rate	12.4	12.5
Deaths under 1 year of age	518	525
Average for 3 prior years	478	
Deaths under 1 year of age, first 25 weeks of year	13,127	12,740
Data from industrial insurance companies:		
Policies in force	64,428,322	65,214,936
Number of death claims	10,814	11,352
Death claims per 1,000 policies in force, annual rate	8.8	9.1
Death claims per 1,000 policies, first 25 weeks of year, annual rate	10.2	10.3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JUNE 28, 1941

Summary

A total of 79 cases of poliomyelitis was reported for the current week as compared with 67 for the preceding week. The 5-year (1936–40) median expectancy for the week is 79 cases, the number reported for the corresponding week in 1940. The total reported to date this year (first 26 weeks) is 715 as compared with a 5-year cumulative median of 776. The States which have reported the largest numbers of cases to date this year are Florida (99), California (67), and Georgia (42).

For the current week, the number of cases declined in Florida from 15 to 10, but increased in Georgia from 9 to 23 and in Alabama from 8 to 10. California reported 7 cases, the same number as reported last week. For the preceding week, 13 of the 15 cases in Florida occurred in the Pensacola area. No cases have been reported in Miami since the week ended May 31.

Of the 9 important communicable diseases included in the following table, the total numbers of cases reported for the first half of 1941 are above the 5-year cumulative medians for only influenza, measles, and whooping cough.

Of 31 cases of endemic typhus fever, 10 cases occurred in Texas, 8 in Georgia, and 5 in Florida; and of 18 cases of Rocky Mountain spotted fever, 8 occurred in the Mountain States and the remainder east of the Rocky Mountains. Six cases of tularemia were reported in Utah and 3 cases in Mississippi.

One case of plague was reported in California.

The death rate for the current week in 87 major cities of the United States is 12.0 per 1,000 population, as compared with 10.9 for the preceding week and with a 3-year (1938–40) average of 10.5. This represents an increase in the urban mortality of 10 percent as compared with the preceding week and of 14 percent as compared with the 3-year average. The cumulative rate in these cities to date this year is 12.4, the same as for the corresponding period of 1940.

Telegraphic morbidity reports from State health officers for the week ended June 28, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40
	June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940	
NEW ENG.												
Maine	0	0	0	------	------	------	82	157	81	0	0	0
New Hampshire	0	0	0	------	------	------	2	6	17	0	0	0
Vermont	0	0	0	------	------	------	80	6	56	0	0	0
Massachusetts	5	1	4	------	------	------	826	1,257	504	4	0	0
Rhode Island	1	0	1	------	------	------	17	77	37	0	1	0
Connecticut [1]	0	0	0	------	------	1	317	15	45	1	0	0
MID. ATL.												
New York [2]	13	16	17	[3] 1	[3] 5	[3] 4	1,361	686	894	4	5	5
New Jersey [2]	3	9	7	3	6	2	784	714	361	3	0	0
Pennsylvania	12	0	19	------	------	------	1,850	260	927	1	1	5
E. NO. CEN.												
Ohio	6	3	20	4	11	7	749	24	450	0	1	2
Indiana	5	0	6	6	3	3	114	14	14	0	0	1
Illinois [2]	15	12	21	11	18	8	428	185	182	0	0	1
Michigan [4]	5	1	9	------	------	------	692	728	218	1	1	1
Wisconsin	1	0	2	7	45	14	1,049	793	313	0	1	1
W. NO. CEN.												
Minnesota	2	4	4	------	1	1	14	61	103	0	0	0
Iowa	1	1	2	6	2	------	92	61	61	0	0	2
Missouri [2]	1	3	6	------	------	------	239	10	18	0	0	1
North Dakota	1	0	0	------	------	------	20	4	6	0	0	0
South Dakota	3	0	0	------	2	------	6	3	0	0	0	0
Nebraska	5	1	1	------	------	------	13	6	8	0	0	0
Kansas	5	3	2	------	3	1	128	122	20	0	1	0
SO. ATL.												
Delaware [2]	0	0	0	------	------	------	14	2	3	0	0	0
Maryland [4]	3	0	5	------	1	------	360	21	47	5	0	1
Dist. of Col.	1	0	4	1	------	------	80	1	42	0	1	0
Virginia [2]	10	6	5	44	11	------	526	136	115	4	3	4
West Virginia [4]	9	2	5	2	4	7	206	38	30	1	0	1
North Carolina	5	1	5	1	------	------	525	57	134	1	2	3
South Carolina	7	10	4	64	80	80	279	13	13	0	0	0
Georgia [1, 2]	3	2	4	4	------	------	228	21	0	0	0	0
Florida [1]	2	1	1	8	------	------	49	22	18	0	0	0
E. SO. CEN.												
Kentucky	1	4	3	2	5	5	96	77	71	1	3	3
Tennessee [2]	4	3	3	18	7	4	150	21	21	1	0	0
Alabama [1]	9	6	5	1	------	5	94	62	47	2	0	2
Mississippi [1, 4]	3	0	4	------	------	------	------	------	------	0	1	0
W. SO. CEN.												
Arkansas	2	2	3	2	------	3	114	17	8	0	0	0
Louisiana	1	5	5	------	10	10	2	5	5	0	0	0
Oklahoma	2	0	4	9	7	8	63	16	23	0	1	1
Texas [1]	23	9	16	273	89	76	303	245	127	2	0	1
MOUNTAIN												
Montana [1]	0	0	1	------	------	------	6	31	31	1	0	0
Idaho	0	0	0	4	------	------	23	10	10	0	0	0
Wyoming [2]	0	1	0	------	------	------	5	6	2	0	0	0
Colorado	9	15	13	11	------	------	92	37	41	1	0	0
New Mexico	3	2	1	------	1	1	52	46	23	0	0	0
Arizona	0	1	2	40	30	15	90	74	14	0	0	0
Utah [2, 4]	0	0	0	------	------	------	17	126	58	0	0	0
Nevada	0	------	------	------	------	------	1	------	------	0	------	------
PACIFIC												
Washington	4	0	0	------	------	------	52	61	72	1	1	1
Oregon	4	8	4	6	3	10	34	75	40	1	0	0
California [1]	7	11	20	[5] 356	62	14	285	204	472	2	3	3
Total	196	143	247	884	406	406	12,699	6,619	6,619	37	26	41
26 weeks	6,591	7,772	11,649	505,363	166,672	149,475	801,124	207,940	253,856	1,209	983	1,898

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 28, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940		June 28, 1941	June 29, 1940	
NEW ENG.												
Maine	0	0	0	2	6	11	0	0	0	1	1	1
New Hampshire	0	0	0	0	1	1	0	0	0	0	0	0
Vermont	0	0	0	4	3	4	0	0	0	0	0	0
Massachusetts	0	0	0	147	76	122	0	0	0	1	5	2
Rhode Island	0	0	0	7	1	7	0	0	0	0	0	0
Connecticut [1]	0	0	0	23	38	24	0	0	0	0	0	2
MID. ATL.												
New York [2]	4	1	2	218	219	226	0	0	0	11	6	11
New Jersey [2]	0	0	0	82	108	58	0	0	0	3	4	4
Pennsylvania	1	0	0	138	133	223	0	0	0	8	13	13
E. NO. CEN.												
Ohio	0	1	1	75	82	121	0	0	1	8	15	8
Indiana	0	0	0	22	21	26	0	0	7	5	0	3
Illinois [2]	0	3	3	129	263	183	3	3	21	15	6	8
Michigan [4]	0	1	1	126	104	149	1	0	0	2	3	3
Wisconsin	0	5	0	53	60	60	2	4	2	0	1	1
W. NO. CEN.												
Minnesota	1	2	0	29	25	27	0	2	7	0	0	0
Iowa	0	4	0	15	13	17	0	8	12	0	3	3
Missouri [2]	0	0	0	37	20	27	0	5	11	5	5	13
North Dakota	0	0	0	0	6	5	0	0	3	0	1	0
South Dakota	0	0	0	4	2	11	15	1	4	0	0	0
Nebraska	0	1	0	8	8	8	1	0	1	0	2	0
Kansas	0	3	1	14	19	34	0	1	6	3	2	2
SO. ATL.												
Delaware [2]	0	0	0	2	4	3	0	0	0	0	1	2
Maryland [4]	0	0	0	12	11	14	0	0	0	0	1	2
Dist. of Col	0	1	0	3	11	6	0	0	0	0	0	0
Virginia [2]	2	1	1	12	7	4	0	0	0	3	5	7
West Virginia [4]	2	0	0	17	14	13	0	0	0	3	3	6
North Carolina	1	0	2	16	11	12	0	0	0	2	6	12
South Carolina	2	0	1	2	2	1	0	1	0	3	6	16
Georgia [1,2]	23	0	3	8	1	5	1	0	0	18	13	25
Florida [1]	10	0	0	3	1	1	0	0	0	1	2	2
E. SO. CEN.												
Kentucky	0	0	0	19	26	15	0	0	0	9	9	12
Tennessee [2]	1	0	1	19	18	6	0	1	1	11	13	15
Alabama [1]	10	0	2	4	11	7	0	4	0	3	4	10
Mississippi [1,4]	5	1	1	2	1	2	0	0	0	9	8	15
W. SO. CEN.												
Arkansas	0	0	0	1	5	2	0	1	1	12	10	13
Louisiana	3	0	1	5	5	5	0	0	0	24	15	20
Oklahoma	1	0	0	10	15	7	0	3	3	12	3	7
Texas [1]	2	3	3	14	11	32	0	0	1	12	15	21
MOUNTAIN												
Montana [2]	1	0	0	6	6	6	0	0	2	2	0	1
Idaho	0	2	0	4	2	2	0	0	3	1	1	3
Wyoming [2]	1	0	0	4	0	6	0	0	0	0	1	0
Colorado	1	0	0	15	13	13	0	4	0	3	1	2
New Mexico	1	1	0	2	7	7	0	0	1	4	0	7
Arizona	0	0	0	4	3	3	0	0	0	0	1	4
Utah [2,4]	0	1	0	5	0	6	0	0	0	0	0	0
Nevada	0	------	------	0	------	------	1	------	------	0	------	------
PACIFIC												
Washington	0	12	1	10	13	13	0	0	2	3	1	1
Oregon	0	0	0	8	2	12	5	0	2	2	5	4
California [1]	7	36	7	68	75	97	0	0	7	6	4	8
Total	79	79	79	1,408	1,483	1,617	29	38	151	205	195	310
26 weeks	715	776	776	86,857	112,937	130,360	1,113	1,763	7,370	2,454	2,646	3,791

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended June 28, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, week ended—June 28, 1941	Whooping cough, week ended—June 29, 1940
NEW ENG.		
Maine	15	25
New Hampshire	0	2
Vermont	8	23
Massachusetts	191	144
Rhode Island	13	6
Connecticut [1]	47	29
MID. ATL.		
New York [3]	270	262
New Jersey [2]	118	50
Pennsylvania	307	315
E. NO. CEN.		
Ohio	236	318
Indiana	16	20
Illinois [2]	117	79
Michigan [4]	282	197
Wisconsin	129	78
W. NO. CEN.		
Minnesota	79	30
Iowa	32	35
Missouri [2]	67	0
North Dakota	20	10
South Dakota	11	12
Nebraska	18	15
Kansas	152	44
SO. ATL.		
Delaware [2]	5	5
Maryland [4]	79	151
Dist. of Col.	9	1
Virginia [2]	102	71
West Virginia [4]	55	100
North Carolina	330	112
South Carolina	160	24
SO. ATL.—continued		
Georgia [1, 2]	17	13
Florida [1]	11	8
E. SO. CEN.		
Kentucky	69	61
Tennessee [2]	71	37
Alabama [1]	23	15
Mississippi [1, 4]	----------	----------
W. SO. CEN.		
Arkansas	13	22
Louisiana	14	33
Oklahoma	50	42
Texas [1]	361	279
MOUNTAIN		
Montana [2]	27	1
Idaho	14	25
Wyoming [2]	5	5
Colorado	204	21
New Mexico	36	25
Arizona	12	34
Utah [2, 4]	70	164
Nevada	0	----------
PACIFIC		
Washington	134	61
Oregon	23	25
California [1]	558	346
Total	4,580	3,370
26 weeks	119,698	83,686

[1] Typhus fever, week ended June 28, 1941, 31 cases, as follows: Connecticut, 1; Georgia, 8; Florida, 5; Alabama, 4; Mississippi, 2; Texas, 10; California, 1.
[2] Rocky Mountain spotted fever, week ended June 28, 1941, 18 cases, as follows: New York, 1; New Jersey, 1; Illinois, 1; Missouri, 3; Delaware, 1; Virginia, 1; Georgia, 1; Tennessee, 1; Montana, 1; Wyoming, 6; Utah, 1.
[3] New York City only.
[4] Period ended earlier than Saturday.
[5] Delayed reports.

HUMAN CASE OF PLAGUE IN SISKIYOU COUNTY, CALIF.

A fatal human case of plague has been reported in Siskiyou County, Calif., with onset on June 14, 1941, and death on June 26. The case occurred in a 10-year-old boy, residing near Montague. The diagnosis was confirmed bacteriologically. The source of the infection has not been determined, but it is believed to have been ground squirrels.

PLAGUE INFECTION IN KERN COUNTY, CALIF.

IN FLEAS FROM GROUND SQUIRRELS

Under date of June 18, 1941, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved, by animal inoculation and cultures, in a pool of 138 fleas from 8 ground squirrels, *C. beecheyi*, submitted to the laboratory on June 5, from a ranch 4 miles west and 5 miles south of Davis Ranger Station, Kern County, Calif.

IN A GROUND SQUIRREL

Under date of June 20, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in organs from a ground squirrel, *C. beecheyi*, submitted to the laboratory on June 6 from a ranch 3 miles south of Davis Ranger Station, Kern County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 14, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	105	35	18	3,279	335	1,072	12	362	33	1,201	--------
Current week [1]	70	43	11	4,539	227	934	1	317	34	1,450	--------
Maine:											
Portland	0	------	1	3	1	0	0	0	0	8	19
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	8
Manchester	0	------	0	0	2	4	0	0	0	0	21
Nashua	0	------	0	0	1	0	0	0	0	7	5
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	1	------	0	2	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	3	------	1	190	6	58	0	4	1	66	194
Fall River	2	------	0	6	0	4	0	0	0	4	36
Springfield	0	------	0	72	0	7	0	1	0	2	35
Worcester	0	------	0	30	4	10	0	0	0	7	42
Rhode Island:											
Pawtucket	2	------	0	0	0	1	0	0	0	4	7
Providence	1	------	0	1	1	4	0	2	0	31	51
Connecticut:											
Bridgeport	0	------	0	24	2	2	0	1	0	5	44
Hartford	0	------	0	1	0	2	0	0	0	0	20
New Haven	0	------	0	7	0	13	0	0	0	3	38
New York:											
Buffalo	0	------	0	55	4	38	0	6	0	7	123
New York	13	2	1	541	44	181	0	71	9	88	1,357
Rochester	0	------	0	193	3	2	0	3	0	10	67
Syracuse	0	------	0	16	3	5	0	1	0	33	52
New Jersey:											
Camden	0	------	0	4	1	8	0	0	0	6	20
Newark	0	1	0	64	4	20	0	7	0	17	97
Trenton	0	------	0	41	2	5	0	1	1	0	34
Pennsylvania:											
Philadelphia	4	1	0	154	16	100	0	22	3	71	434
Pittsburgh	0	------	0	475	6	6	0	4	1	25	141
Reading	0	------	0	30	2	2	0	1	0	4	37
Scranton	0	------	--------	20	-------	0	0	-------	0	0	--------

[1] Figures for Terre Haute estimated; report not received.

City reports for week ended June 14, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Ohio:											
Cincinnati	11	------	0	15	7	1	0	4	0	7	107
Cleveland	0	2	1	10	7	42	0	15	2	87	158
Columbus	0	------	0	40	1	12	0	3	0	15	84
Toledo	0	------	0	416	1	2	0	4	0	27	59
Indiana:											
Anderson	0	------	0	8	0	0	0	0	0	1	10
Fort Wayne	0	------	0	3	1	0	0	1	0	1	28
Indianapolis	5	------	0	193	8	7	0	2	0	20	88
Muncie	0	------	0	13	2	1	0	0	1	0	15
South Bend	0	------	0	11	0	0	0	0	0	0	17
Terre Haute	------	------	------	------	------	------	------	------	------	------	------
Illinois:											
Chicago	11	------	1	110	14	98	0	35	0	40	652
Elgin	0	------	0	2	0	0	0	0	0	2	3
Moline	0	------	0	1	0	1	0	0	1	0	10
Springfield	0	------	0	40	0	1	0	0	0	1	21
Michigan:											
Detroit	0	------	0	295	10	128	0	9	1	117	257
Flint	0	------	0	28	1	2	0	0	0	2	20
Grand Rapids	0	------	0	60	0	5	0	2	0	3	23
Wisconsin:											
Kenosha	0	------	0	12	0	0	0	0	0	0	11
Madison	0	------	0	16	0	2	0	0	0	1	6
Milwaukee	0	------	0	476	2	21	0	1	0	45	77
Racine	0	------	0	23	0	2	0	0	0	5	10
Superior	0	------	0	0	0	1	0	0	0	12	12
Minnesota:											
Duluth	0	------	0	0	0	1	0	0	0	37	24
Minneapolis	1	------	0	11	0	16	0	1	4	16	89
St. Paul	0	------	0	1	3	6	0	0	0	12	60
Iowa:											
Cedar Rapids	0	------	------	1	------	2	0	------	0	2	------
Davenport	0	------	------	2	------	0	0	------	0	0	------
Des Moines	0	------	------	3	------	1	0	------	0	0	27
Sioux City	0	------	------	1	------	0	0	------	0	0	------
Waterloo	0	------	------	19	------	1	0	------	0	6	------
Missouri:											
Kansas City	0	------	0	67	4	5	0	7	0	8	83
St. Joseph	0	------	0	0	3	0	0	0	0	0	21
St. Louis	0	------	0	145	6	24	0	2	0	33	175
North Dakota:											
Fargo	0	------	0	2	0	0	0	0	0	14	1
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	15	------	0	0	------	0	1	8
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	9
Nebraska:											
Omaha	1	------	0	7	3	1	0	0	0	0	43
Kansas:											
Lawrence	0	------	0	0	2	0	0	0	0	3	5
Topeka	0	------	0	18	0	2	0	0	1	26	29
Wichita	0	------	0	3	3	2	0	0	0	6	22
Delaware:											
Wilmington	0	------	0	2	0	6	0	0	0	1	23
Maryland:											
Baltimore	1	1	0	353	7	16	0	8	0	64	207
Cumberland	0	------	0	3	0	2	0	0	0	0	15
Frederick	1	------	0	0	0	1	0	0	0	0	2
Dist. of Col.:											
Washington	2	------	0	184	3	5	0	10	0	16	166
Virginia:											
Lynchburg	0	------	0	29	0	0	0	0	0	4	14
Norfolk	2	------	0	3	1	0	0	1	0	2	17
Richmond	2	------	0	63	0	5	0	2	0	0	45
Roanoke	0	------	0	1	0	0	0	0	0	2	14
West Virginia:											
Charleston	0	------	0	2	0	0	0	0	0	0	18
Huntington	0	------	------	5	------	0	0	------	0	0	------
Wheeling	0	------	0	54	1	0	0	0	0	7	19
North Carolina:											
Gastonia	0	------	0	7	1	0	0	0	0	2	------
Raleigh	0	------	0	13	0	0	0	1	0	15	18
Wilmington	0	------	0	24	1	0	0	0	0	30	10
Winston-Salem	0	1	0	7	0	0	0	0	2	10	10

City reports for week ended June 14, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
South Carolina:											
Charleston	0	4	0	0	2	0	0	0	0	0	14
Florence	0		0	1	2	0	0	0	0	5	17
Greenville	0		0	2	0	0	0	0	0	1	10
Georgia:											
Atlanta	0	2	0	16	0	0	0	9	0	0	88
Brunswick	0		0	1	1	0	0	0	0	1	2
Savannah	1		0	9	1	3	0	3	0	0	34
Florida:											
Miami	0	2	0	1	0	0	0	5	1	9	43
St. Petersburg	0		0	5	2	0	0	0	0	0	16
Tampa	0		0	0	0	0	0	0	0	2	26
Kentucky:											
Ashland	0		0	3	0	0	0	1	0	0	8
Covington	0		0	0	2	3	2	1	0	0	9
Lexington	0		0	1	0	0	0	1	0	2	12
Tennessee:											
Knoxville	0		0	17	0	1	0	1	0	10	25
Memphis	1	5	1	65	1	2	1	5	1	16	81
Nashville	0		0	14	1	1	0	4	0	11	43
Alabama:											
Birmingham	0	2	0	8	3	4	0	4	0	3	62
Mobile	0	1	1	2	0	0	0	0	0	0	22
Montgomery	0			2		0	0		0	2	
Arkansas:											
Fort Smith	0			1		0	0		0	0	
Little Rock	0		0	3	0	0	0	1	0	0	20
Louisiana:											
New Orleans	0	2	2	5	5	1	0	14	0	0	141
Shreveport	0		0	0	4	0	0	2	0	0	37
Oklahoma:											
Oklahoma City	0		0	14	1	0	0	0	0	0	31
Tulsa	0		0	22	2	1	0	0	0	3	16
Texas:											
Dallas	0		0		0	0	0	3	0	2	71
Fort Worth	0		0	0	1	0	0	0	3	5	32
Galveston	0		0	1	3	0	0	1	0	0	18
Houston	1		0	1	6	1	0	5	0	4	78
San Antonio	0	2	0	0	2	0	0	4	0	2	69
Montana:											
Billings	0		0	0	1	0	0	0	0	1	13
Great Falls	0		0	1	0	0	0	0	0	0	9
Helena	0		0	1	0	1	0	0	0	0	2
Missoula	0		0	0	0	0	0	0	0	0	3
Idaho:											
Boise	0		0	1	0	0	0	1	0	0	7
Colorado:											
Colorado Springs	0		0	3	4	3	0	0	0	0	13
Denver	6	9	0	99	2	3	0	3	2	100	79
Pueblo	1		0	7	0	0	0	0	0	15	6
New Mexico:											
Albuquerque	1		0	0	1	0	0	2	0	0	7
Arizona:											
Phoenix	0	20		4		0	0		0	10	
Utah:											
Salt Lake City	0		1	3	0	1	0	0	0	14	43
Washington:											
Seattle	0		0	0	3	4	0	2	1	46	98
Spokane	0		0	2	0	1	0	0	0	6	23
Tacoma	0		0	3	2	1	0	0	0	23	40
Oregon:											
Portland	0		0	2	0	3	0	3	0	2	74
Salem	0			1		0	0		0	0	
California:											
Los Angeles	0	8	0	57	2	27	0	16	4	64	306
Sacramento	1		0	4	0	2	0	2	0	31	34
San Francisco	1		0	9	2	3	0	10	0	66	160

City reports for week ended June 14, 1941—Continued

State and city	Meningitis, meningococcus		Polio-myelitis cases	State and city	Meningitis, meningococcus		Polio-myelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Georgia:			
Boston	1	0	0	Atlanta	0	0	1
New York:				Florida:			
Buffalo	1	0	0	Miami	0	0	1
New York	3	1	1	Tennessee:			
New Jersey:				Memphis	0	0	1
Trenton	0	0	1	Louisiana:			
Pennsylvania:				Shreveport	0	1	0
Philadelphia	1	0	0	California:			
Ohio:				Los Angeles	0	0	4
Cleveland	1	0	0				
Maryland:							
Baltimore	2	0	0				

Encephalitis, epidemic or lethargic.—Cases: Trenton, 1; St. Paul, 2; Memphis, 1; Albuquerque, 1. Deaths: Trenton, 1; Memphis, 1.

Pellagra.—Cases: Charleston, S. C., 1; Savannah, 2; Tampa, 1; Memphis, 1; Montgomery, 1; New Orleans, 1; Houston, 1; San Francisco, 2.

Typhus fever.—Cases: Savannah, 2; Miami, 3; Houston, 2.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended May 31, 1941.—During the week ended May 31, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	4	4	2	2	10		6	1		29
Chickenpox		15	1	170	216	87	41	33	44	607
Diphtheria		15		33	3	3	1			55
Dysentery				10						10
Influenza		2					9		178	189
Measles		56	6	475	1,703	64	126	27	234	2,691
Mumps				294	131	33	48	25	16	547
Pneumonia		8			12	1			6	27
Scarlet fever		19	13	90	171	6	22	6	16	343
Tuberculosis	3	1	7	84	40	1	1			137
Typhoid and paratyphoid fever				25	7			1		33
Whooping cough		4		59	164	1	4	3	29	204

Vital statistics—Fourth quarter 1940.—The Bureau of Statistics of Canada has published the following preliminary statistics for the fourth quarter of 1940. The rates are computed on an annual basis. There were 20.5 live births per 1,000 population during the fourth quarter of 1940 as compared with 18.6 for the fourth quarter of 1939. The death rate was 10.2 per 1,000 population for the fourth quarter of 1940 and 9.2 for the same quarter of 1939. The infant mortality rate was 62 per 1,000 live births in this quarter as compared with 59 for the corresponding quarter of 1939. The maternal death rate was 4.3 per 1,000 live births for the fourth quarter of 1940, and 4.2 for the same quarter of 1939.

The accompanying tables give the numbers of births, deaths, and marriages, by Provinces, for the fourth quarter of 1940, and deaths by causes in Canada for the fourth quarter of 1940 and the corresponding quarter of 1939.

Number of births, deaths, and marriages, fourth quarter, 1940

Province	Live births	Deaths (exclusive of stillbirths)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	58, 816	29, 200	3, 648	253	20, 519
Prince Edward Island	464	297	35	2	221
Nova Scotia	3, 023	1, 716	216	13	1, 676
New Brunswick	2, 873	1, 376	262	15	1, 265
Quebec	20, 223	8, 505	1, 496	103	6, 525
Ontario	16, 318	10, 017	826	63	9, 715
Manitoba	3, 655	1, 631	198	11	2, 369
Saskatchewan	4, 713	1, 681	237	15	2, 828
Alberta	4, 168	1, 666	220	16	2, 585
British Columbia	3, 379	2, 311	158	15	2, 335

[1] Exclusive of Yukon and the Northwest Territories.

Deaths, by cause, fourth quarter, 1940

Cause of death	Canada [1] (fourth quarter)		Province								
	1939	1940	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
All causes	26, 321	29, 200	297	1, 716	1, 376	8, 505	10, 017	1, 631	1, 681	1, 666	2, 311
Automobile accidents	559	518	6	38	26	138	211	32	10	19	38
Cancer	3, 131	3, 381	37	178	140	932	1, 198	213	187	198	298
Cerebral hemorrhage, cerebral embolism, and thrombosis	502	565	16	52	52	90	224	39	28	27	37
Diarrhea and enteritis	524	471	1	11	41	250	55	33	32	25	23
Diphtheria	100	87	------	10	3	46	4	3	7	5	------
Diseases of the arteries	2, 728	3, 111	23	171	129	574	1, 539	179	156	114	226
Diseases of the heart	4, 729	5, 422	37	271	184	1, 272	2, 223	308	322	320	485
Homicides	31	28	------	2	------	4	9	1	1	5	6
Influenza	503	1, 104	24	112	62	348	219	34	91	115	99
Measles	33	54	9	10	1	22	6	3	------	2	1
Nephritis	1, 595	1, 807	12	93	59	834	543	53	63	59	91
Pneumonia	1, 539	1, 808	27	118	133	542	575	79	109	102	123
Poliomyelitis	16	19	------	3	------	4	6	1	1	4	------
Puerperal causes	223	253	2	13	15	103	63	11	15	16	15
Scarlet fever	41	38	------	1	------	20	5	1	5	4	2
Suicides	237	199	1	13	7	36	68	12	14	13	35
Tuberculosis	1, 321	1, 298	11	105	65	555	225	77	53	74	133
Typhoid fever	47	69	------	------	5	40	9	6	4	1	4
Other violent deaths	1, 072	1, 135	8	59	43	244	450	69	50	73	130
Other specified causes	------	7, 481	73	418	350	2, 340	2, 343	453	490	458	547
Unspecified or ill-defined causes	------	168	10	19	40	29	18	12	10	14	16
Whooping cough	170	184	------	10	21	82	24	12	15	18	2

[1] Exclusive of Yukon and the Northwest Territories.

Vital statistics—Year 1940—Comparative.—There were 21.4 live births per 1,000 population during the year 1940 as compared with 20.3 in 1939. The death rate was 9.7 per 1,000 population in 1940 and 9.6 in 1939. The infant mortality rate was 56 per 1,000 live births as compared with 61 for 1939. The maternal death rate was 4.0 per 1,000 live births during 1940 and 4.2 for 1939.

The accompanying tables give the numbers of births, deaths, and marriages, by Province, for 1940, and deaths by causes in Canada for 1940 and 1939.

Number of births, deaths, and marriages, year 1940

Province	Live births	Deaths (exclusive of still-births)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	243, 566	110, 578	13, 740	969	123, 277
Prince Edward Island	2, 047	1, 057	135	6	702
Nova Scotia	12, 677	6, 123	788	46	6, 390
New Brunswick	11, 652	4, 959	930	55	4, 826
Quebec	83, 857	32, 799	5, 856	377	35, 071
Ontario	68, 322	38, 386	2, 959	254	41, 231
Manitoba	14, 771	6, 339	756	57	8, 849
Saskatchewan	19, 244	6, 437	968	62	7, 805
Alberta	17, 272	6, 194	830	69	8, 778
British Columbia	13, 724	8, 284	518	43	9, 625

[1] Exclusive of Yukon and the Northwest Territories.

Deaths by cause, year 1940, comparative

Cause of death	Canada [1]		Province								
	1939	1940	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
All causes	108, 951	110, 578	1, 057	6, 123	4, 959	32, 799	38, 386	6, 339	6, 437	6, 194	8, 224
Automobile accidents	1, 584	1, 711	10	105	81	434	746	87	59	73	116
Cancer	12, 399	13, 279	111	748	531	3. 591	4, 828	808	732	757	1, 173
Cerebral hemorrhage, cerebral embolism, and thrombosis	2, 060	2, 287	50	207	183	448	901	127	119	116	136
Diarrhea and enteritis	2, 375	1, 883	16	38	159	1, 050	257	98	121	89	55
Diphtheria	336	212	----	21	13	118	14	9	23	12	2
Diseases of the arteries	10, 884	11, 720	94	570	421	2, 239	5, 758	666	576	517	879
Diseases of the heart	18, 562	20, 243	159	973	719	4, 749	8, 529	1, 193	1, 110	1, 088	1, 723
Homicides	124	147	1	5	-----	24	55	10	16	20	16
Influenza	3, 955	2, 769	40	249	105	955	605	140	246	254	175
Measles	197	167	9	14	1	71	31	18	14	6	3
Nephritis	6, 538	6, 821	53	319	211	3, 225	1, 951	212	282	217	351
Pneumonia	6, 596	6, 117	89	372	379	1, 761	1, 975	372	398	376	395
Poliomyelitis	56	48	1	3	------	17	14	5	2	4	2
Puerperal causes	907	969	6	46	55	377	254	57	62	69	43
Scarlet fever	167	125	------	2	1	66	31	5	9	9	2
Smallpox	1	------	------	------	------	------	------	------	------	------	------
Suicides	978	944	5	28	28	156	336	61	94	96	140
Tuberculosis	5, 977	5, 771	56	409	295	2, 503	1, 008	369	241	322	568
Typhoid fever	180	225	1	2	19	130	27	18	17	3	8
Other violent deaths	4, 487	4, 563	33	260	175	1, 023	1, 753	246	274	318	481
Other specified causes	-------	29, 331	296	1, 636	1, 387	9, 426	9, 181	1, 758	1, 945	1, 736	1, 966
Unspecified or ill-defined causes	-------	624	26	63	126	178	63	34	36	57	41
Whooping cough	541	622	1	53	70	258	69	46	61	55	9

[1] Exclusive of Yukon and the Northwest Territories.

CUBA

Provinces—Notifiable diseases—4 weeks ended May 24, 1941.—During the 4 weeks ended May 24, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	4	2	1	6	1	7	21
Chickenpox	1	6	4	2	4	12	29
Diphtheria	1	19	2			3	25
Dysentery		1					1
Hookworm disease		21					21
Leprosy		1					1
Malaria	18	2		3	2	88	113
Measles		3	2		7	8	20
Poliomyelitis		1					1
Trachoma				3			3
Tuberculosis	19	19	18	45	20	32	153
Typhoid fever	19	47	13	47	13	33	172
Undulant fever					1		1
Whooping cough				9		1	10

[1] Includes the city of Habana.

OUTBREAK OF BUBONIC PLAGUE IN NEW CALEDONIA

According to information furnished the Public Health Service by Dr. R. R. Beard, of the Pan American Airways Co., an outbreak of bubonic plague occurred early this year at the village of Touaourou near Goro, on the island of New Caledonia. Goro is a seaport about 31 miles east of Noumea, the capital.

On February 24, 1941, five deaths from plague had occurred; and up to March 1, the date on which the last case was reported, there had been a total of nine cases with six deaths. Eight cases were stated to have occurred among young girls of a native school.

The diagnosis of plague was confirmed bacteriologically at the Gaston Bourret Institute at Noumea, where the plague bacillus was identified.

The source of the epidemic appears to have been native rats, commonly designated as "brush or coconut-tree rats." Prior to the outbreak, natives in the Goro region had found dead rats and others apparently sick. The disease is stated to be latently endemic in small areas of the colony. Of approximately 2,000 rats caught in Noumea, none was found to be infected.

Measures for control included isolation of the community, quarantine of vessels leaving it, extensive rat trapping, and vaccination of the entire population of the infected area. Anti-plague serum and sulfathiazole were used in treatment. The results of this joint treatment were reported as "very favorable," although no basis was given for the estimate of its efficacy.

New Caledonia is a mountainous, rocky island, 220 miles long and 25 to 30 miles wide, located among the Melanesian Islands of the South Pacific. The climate is warm and moderately moist. It has a population of about 50,000, one-half of which are Melanesians and Polynesians and one-third whites. Housing is stated to be generally of an unsubstantial nature, varying from wooden frame structures used by the whites to thatched huts occupied by the natives. Communication facilities, which are said to be poor, are provided principally by water routes.

Quarantine was discontinued the latter part of March, about 1 month after the last case of plague had been reported.

×

Public Health Reports

VOLUME 56 JULY 11, 1941 NUMBER 28

IN THIS ISSUE

The Bacterial Filtering Efficiency of Hospital Masks

Public Accidents Recorded Among the Urban Population

Oral Transmission of *Plasmodium relictum* in the Pigeon

U.S. PUBLIC HEALTH SERVICE 1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

THE PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • JULY 11, 1941 • *No. 28*

HOSPITAL MASKS: THEIR BACTERIAL FILTERING EFFICIENCY AND RESISTANCE TO AIR FLOW[1]

A COMPARATIVE STUDY

By Roland Rooks, Lewis J. Cralley, and M. E. Barnes

The possible occurrence of pneumonia and epidemic meningitis in our Army camps makes adequate masking a timely topic. Weaver (*1*) was able to show that by masking of nurses and physicians, nasopharyngeal cultures failed to reveal a single carrier among those caring for meningitis patients. He suggests "that it might be used to advantage also by persons caring for pneumonia patients."

The increased interest in the bacterial counts of operating room air and attempts made to sterilize this air have led to further questioning as to the bacterial filtering efficiency of surgical masks. Secondary infections of "clean" surgical cases are not uncommon (*2, 3, 4, 5*). Walker (*6*) found that in a series of deaths due to hemolytic streptococcus infections following operations on patients who should have had "clean" wounds, half of the nursing personnel were carriers of hemolytic streptococci. He states, "again, study of the masks revealed that they were woefully inefficient, as far as they could be considered germ proof. In the absence of other positive evidence, it seemed fair to deduce that this epidemic of streptococcus infection was probably due to streptococci carriers inefficiently masked." Davis (*7*) suggests that adequate masking is not only essential but is the most important procedure, in addition to rubber gloves and gentle handling of tissues, that the surgeon can personally carry out to prevent infection in clean operative wounds. In a recent review of this subject, Hart and Schiebel (*8*) conclude that "sufficient evidence has been brought forward to indicate that the bacteria in the nose and throat of the operating team and of the gallery have distinct possibilities in regard to the infection of wounds. It is obligatory upon the individuals to cover the oral and nasal orifices with adequate masks."

The wide variety in design and material of face masks in actual use reflects in part the lack of conclusive experimental results on the

---

[1] From the Department of Hygiene and Preventive Medicine, State University of Iowa, Iowa City, Iowa.

bacterial filtering efficiency. In the light of the newer concept of droplet infection the usual testing technique of exposure of Petri dishes containing a desirable culture medium during reading or coughing would not appear to be adequate, especially when these plates were not exposed for a sufficient time to allow all possible "droplet nuclei" to settle from the air. Various impermeable types of masks have been suggested (*9*, *10*), but again from the standpoint of "droplet nuclei" these masks would not appear to be adequate. It would seem that the best possible mask is one that acts as a filter. As suggested by Arnold (*11*), "Covering the nose and mouth with an impermeable material deflects the expired air all around the edges of the mask, and the atmospheric pollution is the same as if no mask were worn."

Preliminary experiments show that bacteria do tend to escape around the impermeable type of face mask. These results and additional experimentation on face masks will be reported in a separate paper.

The two problems with which we were immediately concerned and which are reported in this paper are, first, to determine the bacterial filtering efficiency of various textiles and materials; second, to determine the actual resistance to air flow of these same materials.

It was felt that, after the solution of the above two problems, it should be possible to devise a surgical mask of satisfactory type such that in use most of the air would be forced through the mask and not around it.

In beginning this study the technique used by Arnold (*11*) was employed. A 6-inch funnel (covered with the material to be tested) was attached to the Wells air centrifuge intake. It was found, however, that when this air centrifuge is used to pull against air friction such as is produced by covering the funnel with material, the manometer and tube readings become unreliable. When resistance is applied to the intake of the centrifuge in this manner the manometer readings remain the same, although obviously less air is passing through the instrument. As will be pointed out subsequently, our results confirm in part those of Arnold when the materials tested had approximately the same resistance to air flow.

APPARATUS

Experimental chamber.—In order to aid in the control of bacterial dosage an experimental chamber was devised as shown in figure 1. This chamber is constructed of "galvannealed" sheets, painted after construction with aluminum paint. It is of sufficient size (6 feet by 5½ feet by 2½ feet) to enable the necessary testing equipment used to be placed inside this chamber. The chamber can be easily raised and

lowered through the use of counterweights. An opening at one end to which is attached a small vacuum pump makes possible a complete change of air in the chamber in 30 minutes. The air is drawn by means of this pump through a small incinerator and then released into an exhaust hood. A window with necessary lighting makes observation of readings possible from outside the chamber. An oil seal at the base

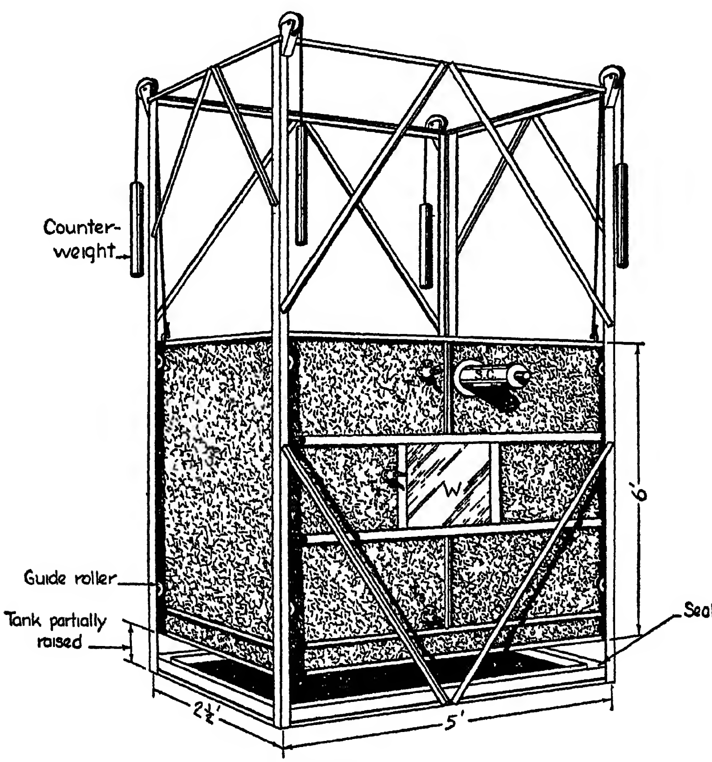


FIGURE 1.—Experimental chamber.

makes the chamber airtight at atmospheric pressures used. Additional points in construction are not of concern in this problem.

Resistance of material to air flow.—Sternstein (*12*) has developed a rapid method of measuring nasal resistance by determining this resistance in terms of air flow. This method was modified to measure resistance of various possible mask materials as shown in figure 2. The material to be tested was placed tightly over the rim of funnel *G*. With valve *E* closed, air flow was created by vacuum pump *P*. This air flow was measured on manometer M_4 and resistance in terms of a suitable flowmeter M_3.

Bacterial filtering efficiency of tested material.—The apparatus used to determine the bacterial filtering efficiency is also shown in figure 2.

The same vacuum pump is used. Manometer M_4 is used to measure total air flow; M_1 and M_2 are flowmeters used to balance the air intake through the "funnel devices" (*13*) *A* and *B*, with valves *C* and *D* used to control this intake. The material to be tested was placed in such a way over a funnel that all of the air was forced through this material. The funnel was then attached to the intake of *A* or *B*. Cultures of *B. prodigiosus* (*S. marcescens*) were sprayed into the air by means of compressed air. The bacteria were impinged on Petri dishes containing nutrient agar. The difference in bacterial count indicated the filtering efficiency.

PROCEDURE

Resistance of material tested to air flow.—With valve *E* closed, the vacuum pump was turned on until flowmeter M_4 showed 9 liters of air per minute being drawn through funnel *G*. The resistance on M_3 was then recorded in millimeters of water. Funnel *G* was then covered with the material to be tested in such a manner that all of the air was drawn through this material. The increased resistance as shown by flowmeter M_3 was recorded. The difference between these two readings was used as an expression of resistance to air flow in millimeters of water. A small funnel area makes flowmeter M_3 much more sensitive. For this reason this funnel, as well as the funnel attached to the "funnel device" to determine the bacterial filtering efficiency, measured 1½ inches. With the rate of air flow used (9 liters per minute) and a small funnel area, flowmeter M_3 was very sensitive to slight changes in resistance. With materials which were considered to have about the same resistance when tested by attempting to breathe through them, it was possible by this method to show marked differences.

Bacterial filtering efficiency of tested materials.—All readings on the bacterial filtering efficiency of the various materials tested were taken with the testing equipment (fig. 2) inside the experimental chamber. A funnel was first attached to the intake of each "funnel device," *A* and *B*. The material to be tested was placed over one of the funnels so that all of the bacteria in the air would be drawn through this material. The vacuum pump (*P*) was turned on with valve *E* open and valve *F* closed until flowmeter M_4 registered 9 liters of air per minute. By means of valves *C* and *D* necessary adjustments were made until the two manometers, M_1 and M_2, showed an equal amount of air being drawn through each sampling device. Although maximum sampling efficiency of the "funnel device" is reported (*13*) for a faster rate of air flow, inasmuch as the same rate was maintained through the material tested as the control, the sampling efficiency remained the same.

After balancing the air intake through each "funnel device" the chamber was closed. Additional procedures, such as spraying of the test organism, starting and stopping the vacuum pump, and taking manometer readings, were carried out by the investigator outside the chamber. The test organism (*B. prodigiosus*) was sprayed into the chamber and the vacuum pump was turned on 6 seconds after spraying. Theoretically all readings were then in terms of "droplet

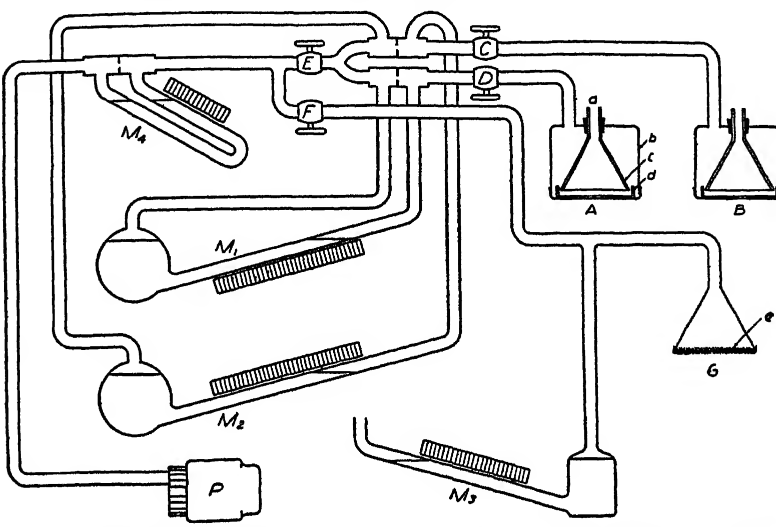


FIGURE 2.—Apparatus for measuring the bacterial filtering efficiency and resistance of materials

nuclei" (*14*). It was believed that there would be a more equal distribution of bacteria throughout the chamber by testing after 6 seconds than if tests were taken during or immediately after spraying. The bacterial dosage was maintained between 100 and 200 bacteria per cubic foot of air sampled. As the results were very consistent, ordinarily a series of five readings were taken on each material tested except when the bacterial dosage was not maintained, in which case an additional five readings were made. The total testing time of each reading was 5 minutes. The exhaust from the vacuum pump acted as a fan to help maintain as uniform a distribution of organisms within the chamber as possible. During spraying, both funnels were so covered that "droplets proper" could not gain entrance into the sampling device.

DISCUSSION AND RESULTS

Although various studies have been reported on the efficiency of gauze masks (*14, 15, 16, 17*), no one appears to have determined the effect of laundering[2] on this efficiency. The bacterial filtering efficiency and resistance to air flow of the ordinary 2-layer new gauze

[2] The standard commercial process.

mask was first studied. It was found to have a resistance to air flow of 1.0 millimeter of water and a bacterial filtering efficiency of 23 percent. After each series of 5 washings, gauze masks of various layers, as shown in table 1, were tested. It was found that maximum filtering efficiency and resistance to air flow were reached on 20 washings. Further tests were carried out until these materials were washed 50 times, with the results as shown in table 2. The 6-layer gauze mask at this time showed a resistance to air flow of 6.0 millimeters of water and a bacterial filtering efficiency of 97 percent.

TABLE 1.—*Classification and description of materials tested* [1]

1. Gauze (42 by 42 strands per inch), 2, 3, 4, 5, and 6 layers.
2. 2 layers of gauze with ¼-inch air space between.
3. 2 layers of gauze containing thin [2] layer of absorbent cotton.
4. 2 layers of gauze containing medium [2] layer of absorbent cotton.
5. 2 layers of gauze containing thick [2] layer of absorbent cotton.
6. Commercial Mask No. 1: 4 layers of gauze (31 by 27 strands per inch).
7. Commercial Mask No. 2: A single layer of canton flannel, double-phased, napped on both sides, 65 by 46 strands per inch, placed inside thin gauze.
8. Commercial Mask No. 3: Constructed of a single layer of broadcloth.
9. Cellucotton (Lewis Manufacturing Co., Walpole, Mass.).
10. Flannel (wool): A virgin flannel having 42 by 42 strands per inch (Amana Woolen Mills, Amana, Iowa).
11. Flannel (cotton): Medium weight, outing flannel, plain weave, napped on both sides, 46 by 42 strands per inch.
12. Rayon: Air spun rayon, 85 by 58 strands per inch.
13. Silk: Pure dye silk, flat crepe.

[1] As verified by Assistant Professor Merle Ford, Home Economics Department, State University of Iowa, Iowa City, Iowa.
[2] Thin=.024 gm. per sq. inch.; medium=.041 gm. per sq. inch; thick=.085 gm. per sq. inch.

In an attempt to devise a mask utilizing this same material in a different manner, additional tests were carried out. The 2-layer gauze mask was tested with an air space of one-fourth inch between the 2 layers of gauze. It was believed that this might possibly increase the bacterial filtering efficiency without changing the resistance to air flow. Tests showed, however, that with this spacing no such increase was shown (table 2).

TABLE 2.—*Bacterial filtering efficiency and resistance to air flow of gauze masks*

	Filtering efficiency	Resistance to air flow, in millimeters of water
	Percent	
2 layers (washed 50 times)	74	2.0
3 layers (washed 50 times)	79	3.0
4 layers (washed 50 times)	88	4.0
5 layers (washed 50 times)	93	5.0
6 layers (washed 50 times)	97	6.0
2 layers (washed 50 times) with ¼-inch air space between layers	70	2.0
2 layers (washed 50 times) containing thin layer of absorbent cotton	89	3.5
2 layers (washed 50 times) containing medium layer of absorbent cotton	92	4.0
2 layers (washed 50 times) containing thick layer of absorbent cotton	97	6.5

Additional tests were carried out with the 2-layer gauze mask, placing within this mask layers of absorbent cotton of varying thickness (table 1). A relatively thick layer of absorbent cotton gave results comparable to the 6-layer (washed) gauze mask.

Three commercial masks were next studied, all of them utilizing different materials in construction (table 1). The first mask was made of 4 layers of gauze (31 by 27 strands per inch). As this was a coarser material than the gauze previously studied, additional tests were not carried out. Mask No. 2 gave a high resistance to air flow (11.0 millimeters) but also showed a high filtering efficiency (98 percent). After washing 50 times the resistance to air flow was increased to 15.5 millimeters of water with a further increase in the bacterial filtering efficiency to 99 percent. It is believed that further study will show that a mask having such a high resistance will allow escape of bacteria around the mask. The third commercial mask made of broadcloth (single layer) had a very high resistance to air flow (15.0 millimeters) and a relatively low filtering efficiency (41 percent).

Arnold (*11*), using a different testing technique, has reported a 100-percent bacterial filtering efficiency for 6 layers of cellucotton. He also suggested that the resistance to air flow was less for cellucotton than for gauze, although this factor was apparently not measured. Our results confirm in large part the findings of Arnold. We found that 8 layers of cellucotton gave a bacterial filtering efficiency of 97 percent, with a lower resistance than 6 layers of gauze (table 3). If cellucotton is to be used in masks, some suitable means for holding it in place must be considered. This problem, and the difficulty of sterilizing it, constitute disadvantages to be overcome.

TABLE 3.—*Bacterial filtering efficiency and resistance to air flow of other materials tested*

	Filtering efficiency	Resistance to air flow in millimeters of water
	Percent	
Cellucotton (8 layers)	97	4.0
Amana wool (1 layer washed 50 times)	100	13.5
Cotton flannel (1 layer, medium weight, washed 50 times)	98	11.0
Air spun rayon (2 layers washed 50 times)	92	8.5
Silk (flat crepe, single layer)	83	8.5

That there is a marked difference in the filtering efficiency of different materials when comparison is made with resistance is indicated in table 3. Although "Amana" wool gave a high filtering efficiency, the resistance to air flow after washing would appear to be too high to make this material suitable for mask construction.

In table 4 are shown the materials which according to this testing technique appeared to have the greatest possibilities in mask construction. Although most studies have indicated a very low

efficiency for gauze masks, our results show that the structure of this material is so changed by laundering as to make it a relatively good material, although not as desirable as cellucotton in bacterial filtering efficiency and resistance to air flow.

TABLE 4.—*Bacterial filtering efficiency and resistance to air flow of materials showing greatest possibilities for mask construction*

	Filtering efficiency	Resistance in millimeters of water
	Percent	
Cellucotton (8 layers)	97	4.0
Gauze (42 by 42 strands per inch, 6 layers, washed 20 times)	97	6.0
Gauze (42 by 42 strands per inch, 2 layers, washed 20 times, containing a single layer of thick absorbent cotton)	97	6.5

Theoretically, it might be expected that a certain optimum point might be reached from the standpoint of resistance to air flow and filtering efficiency beyond which, as the resistance to air flow increases, there is a greater tendency for bacteria to escape into the air around the mask. If this optimum can be determined, then it should be possible to develop a mask that will give a high filtering efficiency as shown by actual use. Research from this standpoint and additional factors in mask construction are to be reported in a separate paper.

CONCLUSIONS

A series of studies made on materials varying in structure and composition in which it was possible to measure the bacterial filtering efficiency and the resistance to air flow of these same materials appear to justify the following conclusions:

1. The laundering of gauze enormously increases the bacterial filtering efficiency with only a slight increase in its resistance to air flow.
2. The maximum bacterial filtering efficiency of gauze masks is reached after 20 periods of laundering.
3. A 6-layer gauze mask (42 by 42 strands) after 20 launderings showed a 97-percent bacterial filtering efficiency.
4. Of the various materials tested, cellucotton showed an advantage insofar as high bacterial filtering efficiency and low resistance to air flow are concerned. Certain disadvantages to its use in masks exist.
5. Materials having the same resistance to air flow vary widely in their bacterial filtering efficiency.

ACKNOWLEDGMENTS

The materials tested in these studies were secured by purchase, except the commercial and hospital masks which were supplied by David W. Stickney of the Lewis Manufacturing Co., T. R. Ponton,

M. D., editor of Hospital Management, and R. J. Connor, assistant administrator, University Hospitals, Iowa City. Mr. L. A. Bradley, manager of the university laundry, handled the details involved in the repeated laundering of the materials studied.

REFERENCES

(*1*) Weaver, George H.: The value of the face mask and other measures in prevention of diphtheria, meningitis, pneumonia, etc. J. Am. Med. Assoc., **70**: 76–78 (January 1918).
(*2*) Cairns, Hugh: Bacterial infection during intracranial operations. Lancet, **1**: 1193–1198 (May 1939).
(*3*) Ives, Howard R., and Hirshfeld, John W.: The bacterial flora of clean surgical wounds. Ann. Surg., **107**: 607–617 (April 1938).
(*4*) Overholt, Richard H., and Betts, Reeve H.: A comparative report on infection of thoracoplasty wounds. J. Thoracic Surg., **9**: 520–529 (June 1940).
(*5*) Meleney, F. L.: Infection in clean operative wounds. Surg. Gyn. and Obstet., **60**: 264–275 (February 1935).
(*6*) Walker, I. J.: How can we determine the efficiency of surgical masks? Surg. Gyn. and Obstet., **50**: 266–270 (January 1930).
(*7*) Davis, John S.: Is adequate masking essential for the patient's protection? Ann. Surg., **105**: 990–997 (June 1937).
(*8*) Hart, D., and Schiehel, H. M.: Role of the respiratory tract in contamination of air; a comparative study. Arch. Surg., **38**: 788–796 (April 1939).
(*9*) Tottenham, R. E.: A new operating mask. Brit. Med. J., **1**: 756 (April 1936).
(*10*) Mellinger, H. V.: New mask that protects both physician and patient. J. Am. Med. Assoc., **45**: 662–663 (August 1930).
(*11*) Arnold, Lloyd: A new surgical mask. A bacteriologic air filter. Arch. Surg., **37**: 1008–1016 (December 1938).
(*12*) Sternstein, H. J.: Quantitative study of nasal obstruction. Arch. Otolaryngol., **23**: 475–479 (April 1936).
(*13*) Hollaender, Alexander, and DallaValle J. M.: A simple device for sampling air-borne bacteria. Pub. Health Rep., **54**: 574–577 (April 7, 1939). Reprint No. 2055.
(*14*) Gautheir, P. P.: A comparative study of three surgical masks. Canad. Med. Assoc. J., **37**: 250–252 (September 1937).
(*15*) Leete, H. Mason: Some experiments on masks. Lancet, **1**: 392–393 (March 1919).
(*16*) Doust, B. C., and Lyon, A. B.: Face masks in infections of the respiratory tract. J. Am. Med. Assoc., **71**: 1216–1219 (October 1918).
(*17*) Blatt, M. L., and Dale, M. L.: A bacteriological study of the efficiency of face masks. Surg. Gyn. and Obstet., **57**: 363–368 (September 1933).

PUBLIC ACCIDENTS AMONG THE URBAN POPULATION AS RECORDED IN THE NATIONAL HEALTH SURVEY[1]

By JOAN KLEBBA, *Junior Statistician*, and ROLLO H. BRITTEN, *Senior Statistician, United States Public Health Service*

In the United States more than 50,000 accidental deaths occur annually in public places (streets, highways, buildings, parks, beaches, etc.).[2] These deaths account for 4 percent of all deaths and 50 percent of all accidental deaths in the country. Moreover, public accidents

[1] From the Environmental Sanitation Section of the Division of Public Health Methods, National Institute of Health. Acknowledgment for assistance in the preparation of this article is made to David E. Hailman and James S. Fitzgerald. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Projects Nos. 712159-658/9999 and 765-23-3-10.

[2] Based on an average of the number of deaths occurring in the years 1935–38 as reported by the U. S. Bureau of the Census.

rank high among all causes of death due to disease and accident as well as among all fatal accidents, being the cause of more than one-third as many deaths as all infectious and parasitic diseases combined (including among others, tuberculosis, typhoid fever, smallpox, measles, scarlet fever, whooping cough, diphtheria, influenza, poliomyelitis, and meningitis) and of more than diabetes and appendicitis combined. Almost five times as many fatal accidents occur in public places as occur in industry, and over twice as many as in the home.[3]

Motor-vehicle accidents are by far the most important means of accidental deaths occurring in public places, causing approximately 70 percent of all fatal public accidents.

Further evidence of the seriousness of public accidents is provided by data collected in the National Health Survey (1935–36),[4] which includes information relating to the frequency and amount of disability resulting from public accidents, fatal[5] and nonfatal, occurring within the 12 months immediately preceding the enumerator's visit.

The purpose of the present report is to describe the material collected in the National Health Survey on public accidents (among 2,498,180 white and colored persons of known age, or 3.6 percent of the urban population of the United States (1930)).[6] Specifically, it

[3] Average annual number of deaths (based on number of deaths occurring in the years 1935–38 as reported by the U. S. Bureau of the Census) according to specified cause is as follows:

Cause of death	*Average for years 1935–38*
All infectious and parasitic diseases	141,320
Diabetes	30,099
Appendicitis	15,566
Accidents	102,209
Industry	10,178
Home	23,738
Public (including average of 34,256 for motor vehicles)	49,272
Unspecified as to place of occurrence	19,021

[4] Perrott, George St. J., Tibbitts, Clark, and Britten, Rollo H.: The National Health Survey: Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting. Pub. Health Rep., 54: 1663 (1939). Reprint No. 2098.

[5] Ibid., p. 1671. As pointed out in this previous report, it has been known since the U. S. Census of 1850 that mortality data obtained in house-to-house canvasses are particularly subject to underenumeration. Disappearance of single-person households, breaking up of other households, lack of coverage of orphanages, homes for the aged, and other institutions in which the death rates are particularly high, and the difficulty of establishing the concept of reporting on past members of the household, are some of the factors which result in abnormally low death rates.

For these reasons fatal accident cases are not presented separately. However, in order to give as complete figures as possible in regard to serious accidents occurring within the study year, they are combined with the nonfatal cases in the frequency and disability rates.

Fatal and hospitalized cases even of less than 7 days of disability before termination or recovery are included.

[6] The sample was chosen to be representative in general of cities in the United States according to region and size. In large cities (100,000 and over) the population to be canvassed was determined by a random selection of many small districts based on those used in the U. S. Census of 1930. In the smaller cities selected for study the population was enumerated completely. See article by Perrott, Tibbitts, and Britten cited in footnote 4 for a more detailed account of the sampling procedure and a comparison of certain characteristics of the population enumerated with those of the urban population as a whole (Census, 1930).

The survey, covering over 700,000 urban households in the United States, followed established techniques. Trained enumerators were employed to obtain the information from the housewife or other responsible member of the household.

presents the frequency of public accidents disabling for 1 week or more by age, sex, economic status, means of injury, and size of city, and the days of disability per person and average duration of periods of disability by age.[7]

Definition of public accident.—Only those accidents[8] which the enumerator recorded as fulfilling the following requirements as to place of occurrence and resulting disability are included in the present report:

(1) The place of occurrence must have been on a public street or highway, or in other public place.[9] Regardless of whether the injury arose out of or in the course of gainful employment, if the injured person was operating, riding in, or struck by a motor vehicle used in land transportation, the event is included with those occurring in a public place.

(2) The event must have resulted in disability (that is, inability to work, attend school, care for the home, or engage in other customary activity) lasting 1 week or more within the 12 months immediately preceding the visit or in hospitalization or death.[10]

In addition to the means of injury (or death) commonly thought of in connection with public accidents, such as a collision between vehicles, public or private, falling of building construction material on a pedestrian, attack by a venomous animal, and drowning at a public beach, other means, such as poisonous food served in a public eating place, heat exhaustion, and lightning (but not a brawl or suicidal attempt resulting in injury) are included.

Frequency of public accidents.—The annual frequency of public accidents (sole, primary, and contributory causes[11]) which disabled

---

[7] For a summary of data obtained on illnesses and accidents, see Britten, Rollo H., Collins, Selwyn D., and Fitzgerald, James S.: The National Health Survey: Some general findings as to disease, accidents, and impairments in urban areas. Pub. Health Rep., 55: 445 (1940). Reprint No. 2143.

[8] For accidents (and for impairments resulting from accidents) the enumerator entered on the schedule the means of injury (such as burn, fall, etc.) and whether the accident occurred at home, at work, or in a public place. The 1929 Revision of the International List of the Causes of Death, with some modifications, was used as a basis for classification of means of injury as recorded by the enumerator.

[9] A small number of accidents involving a motor vehicle are classified as public accidents (459, or 3 percent of a total of 16,282) even though unspecified as to place of occurrence (16 cases), or reported as occurring on residential property (98 cases), or in a railroad shop or yards or other industrial work place not open to the public (345 cases).

[10] Accidents causing disability on the day of the interview (whether or not the disability had attained a duration of 1 week or more) were also recorded. Thus two indices of the frequency of public accidents are obtainable: (*a*) An annual frequency rate of periods of disability of 1 week or more, and (*b*) the proportion of persons disabled on the day of the visit. Only the former index, however, is used in this report.

Except for accidents which caused disability on the day of the visit or resulted in hospitalization or death, no attempt was made to obtain a record of those which disabled for less than 1 week.

A nominal number of accidents which caused disability of at least 7 days within the 12-month period, but occurred prior to it, have been included.

[11] For a discussion of classification of disability according to sole, primary, and contributory causes see Britten, Collins, and Fitzgerald, op. cit., footnote 11, p. 448, and lines 21–26, p. 463.

In 90 percent of 16,488 reported periods of disability of 1 week or more in which a public accident was involved, the sole cause (or diagnosis) was the public accident, in 7 percent the public accident was the primary cause, and in only 3 percent, the contributory cause.

A small number of accident diagnoses (228) contributory to another accident diagnosis have been included for convenience in tabulating.

for 1 week or more was 6.6 per 1,000 persons [12] or 3.9 percent of all such cases of disability (from disease and accident) as reported in the National Health Survey.[13] Over 48 percent of public accidents (disabling for 1 week or more) involved a motor vehicle (whether the injured person was operating, riding in, or struck by a motor vehicle, including automobile, bus, truck, and motorcycle, but not streetcar or motorboat), the annual frequency rate being 3.17 per 1,000 for these accidents and 3.43 for public accidents exclusive of motor-vehicle accidents. Of the public accidents which did not involve automobiles, a large proportion were undoubtedly due to sports and recreations.

The severe nature of accidents occurring in public places is obvious from the fact that 55 percent of the cases of disability lasting 7 or more days had a duration of 1 month or longer.[14] The rate for cases disabling 1 month or more is 1.83 per 1,000 persons for public accidents involving motor vehicles and 1.77 for public accidents exclusive of motor-vehicle accidents.

Amount of disability from public accidents.—The annual number of days of disability due to public accidents (disabling for 1 week or more) was 0.33 per person in the observed population, or 44 percent of the total rate for accidents (0.75 days, all places of occurrence) and 3 percent of the total rate for all causes (9.9 days). Accidents involving motor vehicles, for which the annual days of disability per person in the observed population was 0.18, made up approximately 55 percent of the annual number of days of disability per person due to all public accidents combined.

The average duration (within the 12-month period) of public accidents disabling for 1 week or more was 51 days. For accidents involving motor vehicles the average duration (57 days) was 6 days longer than the average duration of all public accidents combined.[15]

Public accidents by sex.—The annual frequency rate of public accidents was over 46 percent higher for males than for females. As shown in table 1, the rate for males (all ages) was 7.90 per 1,000 persons and that for females, 5.40.

---

[12] Since the informant was asked at a single visit to recall accidents which had occurred in the family during the previous 12 months, this rate is somewhat below the true value, even though a minimum period of disability (7 consecutive days) was set in order to avoid too great underreporting.

[13] Forty-three percent of the accidents with known place of occurrence reported in the National Health Survey occurred in public places, 31 percent occurred in the home, and 26 percent were occupational. See Britten, Collins, and Fitzgerald, op. cit., p. 464.

[14] Particularly because of a certain amount of underreporting for the less severe accidents, the rate for public accidents disabling 1 month or more is somewhat more reliable than the rate for public accidents with a minimum period of disability of 7 days.

[15] Inclusion of public accidents disabling for less than 1 week would have slightly increased the days per person and greatly decreased the average duration of disability. Based on unpublished data from the survey made by the Committee on the Costs of Medical Care, which shows 0.73 days of disability from all causes (illnesses and accidents) per person per year for cases disabling less than 7 consecutive days, it is estimated that for public accidents the annual number of days of disability per person observed would be about 0.35 if cases disabling less than 1 week could have been included.

For that portion of public accidents involving a motor vehicle the rate for males (3.92 per 1,000 persons) was 57 percent higher than that for females (2.49), while for public accidents exclusive of motor-vehicle accidents the rate for males (3.98 per 1,000 persons) was 37 percent higher than that for females (2.91).

TABLE 1.—*Annual frequency of public accidents disabling for 1 week or more [a] by age and sex [b]*

Age (years)	Annual frequency per 1,000 persons			Ratio of the rate for males to that for females (rate for males=100)	Number of cases [c]		
	Both sexes	Male	Female		Both sexes	Male	Female
	Total public accidents						
All ages	6.60	7.90	5.40	146	16,487	9,477	7,010
Under 5	1.63	2.08	1.16	179	286	186	100
5-9	6.32	8.35	4.29	195	1,282	850	432
10-14	7.73	10.93	4.48	244	1,733	1,230	503
15-24	7.04	9.78	4.68	209	3,145	2,023	1,122
25-44	5.78	6.64	5.00	133	4,740	2,575	2,165
45-64	8.00	8.06	7.95	101	3,886	1,926	1,960
65 and over	9.94	10.79	9.24	117	1,415	687	728
	Public accidents involving motor vehicles						
All ages	3.17	3.92	2.49	157	7,929	4,701	3,228
Under 5	.82	1.12	.51	220	144	100	44
5-9	2.22	2.88	1.57	183	451	293	158
10-14	1.92	2.72	1.11	244	430	305	125
15-24	3.27	4.08	2.57	159	1,460	844	616
25-44	3.43	4.17	2.76	151	2,813	1,618	1,195
45-64	4.05	4.83	3.29	147	1,966	1,154	812
65 and over	4.67	6.08	3.53	172	665	387	278
	Public accidents exclusive of motor-vehicle accidents						
All ages	3.43	3.98	2.91	137	8,558	4,776	3,782
Under 5	.81	.96	.65	148	142	86	56
5-9	4.10	5.47	2.72	201	831	557	274
10-14	5.81	8.21	3.37	214	1,303	925	378
15-24	3.77	5.70	2.11	270	1,685	1,179	506
25-44	2.35	2.47	2.24	110	1,927	957	970
45-64	3.95	3.23	4.66	69	1,920	772	1,148
65 and over	5.27	4.71	5.71	82	750	300	450

That this excess in the public accident rate for males may not be attributable to a sex differential in accident proneness is suggested by the fact that the National Health Survey rate for home accidents was almost one-and-one-half times as high for females as for males.[16]

Because of the possibility of slightly more complete reporting by an informant of his or her own illness, the excesses in the rates for males may be somewhat of an understatement since in a greater percentage of instances females were the informants.

[16] See Britten, Rollo H., Klebba, Joan, and Hailman, David E.: Accidents in the urban home as recorded in the National Health Survey. Pub. Health Rep., 55: 2061 (1940).

Public accidents by age.—From infancy to age 15 years the annual frequency rate of public accidents increased, but the rate of increase from one age group to the next for this period varied widely. For children under 5 years the annual frequency rate was 1.63 per 1,000; for children 5–9 years, 6.32; and for children 10–14 years, 7.73. From age 15 to 45 years the annual frequency rate decreased, being 7.04 for the age group 15–24 years and 5.78 for the age group 25–44 years. After age 45 the rate increased with age from 8.00 for persons 45–64 years to 9.94 for persons 65 years and older.

As is also evident from table 1, for children under 5 years there was practically no difference between the number of public accidents (causing disability of 1 week or more) involving a motor vehicle and the number of public accidents exclusive of motor-vehicle accidents. From age 5 to 25 years, however, accidents not involving motor vehicles were of much greater frequency than motor-vehicle accidents, while from age 25 to 65 years motor-vehicle accidents were more frequent than other public accidents. After age 65 other public accidents were again more frequent than motor-vehicle accidents.

Amount of disability from public accidents by age.—The days of disability per person in the observed population for public accidents causing disability of 1 week or more rose steeply from 0.06 for children under 5 years of age to 0.24 for children 5–9 years, showed but little variation over the range 5–44 years, and then increased with advancing age to 0.75 for persons 65 years and older, as shown in table 2. Up until about age 15 motor-vehicle accidents caused fewer days of disability per person in the observed population than did other public accidents; over the range 15–64 years the reverse was true; and after age 65 the two rates were approximately equal.

TABLE 2.—*Annual days of disability per person observed and days of disability per case for public accidents disabling 1 week or more,[a] by age*

Age (years)	Annual days of disability per person observed [b]			Days of disability per case			Number of cases [d]
	Total	Public accidents involving motor vehicles	Public accidents exclusive of motor-vehicle accidents	Total	Public accidents involving motor vehicles	Public accidents exclusive of motor-vehicle accidents	
All ages	0.33	0.18	0.15	50.8	56.8	45.3	16,198
Under 5	.06	.03	.03	35.9	37 7	34.1	274
5–9	.24	.10	.14	37.3	43 9	33.7	1,265
10–14	.26	.08	.18	34.4	43.9	31.4	1,708
15–24	.29	.15	.14	42.1	48.1	36.9	3,076
25–44	.29	.18	.11	51.5	55.0	46.3	4,647
45–64	.48	.26	.22	60.1	64 5	55.7	3,828
65 and over	.75	.37	.38	76.9	80.8	73.6	1,400

The average length of periods of disability from public accidents increased steadily with age from 36 days for children under 5 years to 77 days for persons 65 years and older, with but one break in the

trend—for children 10–14 years of age the average length of periods of disability was 34 days, the lowest in the series. (See table 2.)

The average length of periods of disability from public accidents involving motor vehicles was higher at every age than that for public accidents exclusive of motor-vehicle accidents. Also, the average length of periods of disability for the former group of accidents in-

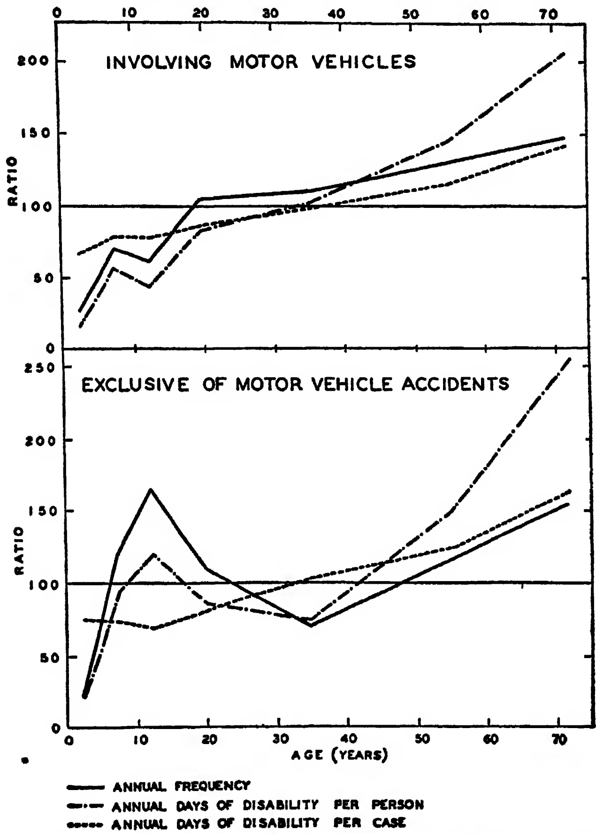


FIGURE 1.—Annual frequency and days of disability per person and per case of public accidents disabling for 1 week or more,[a] by age,[b] expressed as the ratio of the rate for each age group to that for all ages (rate for all ages=100)

creased steadily with age (except over the range 5–14 years, for which period it was constant) from 38 days for children under 5 years to 81 days for persons 65 years and older, while for the latter it decreased from 34 days for children under 5 years to 31 days for children 10–14 years, and then increased steadily with age to 74 days for persons 65 years and older.

As is evident in figure 1, in the case of motor-vehicle accidents disabling for 1 week or more the increase with age in annual days of disability per person in the observed population was due to an increase with age both in frequency and in average duration of disability.

The same relation obtained for public accidents exclusive of motor-vehicle accidents after about age 45 years, but not for the younger age groups. From infancy to about age 15 years the increase in the annual days of disability per person reflects solely the increased frequency of public accidents, since for this age group the annual frequency increased while the average length of periods of disability decreased. Similarly, for persons 15–44 years the decrease in the annual days of disability per person may be attributed to a decrease in the annual frequency, since for this group the annual frequency decreased while the average length of periods of disability increased.

Public accidents by age and sex.—As shown in table 1, at each age group the annual frequency rate of public accidents disabling for 1 week or more was higher for males than for females. The greatest excess in the rate for males over that for females occurred among children 10–14 years, the rate for males in this group being over 144 percent higher than that for females. Moreover, the excess in the rates for males was very much greater among persons under 25 years than for those over 25 years, as evidenced by the ratio of the rate for males to that for females, also shown in table 1.

For persons under 25 years of age the great excess in the rate for males over that for females was primarily due to public accidents other than those involving motor vehicles. This is evident from a comparison of figures 2 and 3.

In the case of public accidents involving motor vehicles the rate for males was higher than that for females for each age group, and the excesses in the rate for males over that for females were greater among persons under 15 and over 65 years than for persons 15–64 years. The highest rate for each sex (6.08 for males and 3.53 for females) occurred for persons 65 years and older. The greatest excess in the rate for males over that for females (144 percent) occurred for persons 10–14 years of age.

For public accidents exclusive of motor-vehicle accidents the situation was different in several respects. The rate for males was higher than that for females among persons under 45 years of age, but for persons over 45 years of age the rate for females was considerably higher than that for males (fig. 3). The highest rate for males (8.21 per 1,000 persons) was for persons 10–14 years of age, and for females (5.71), for persons 65 years and older. The greatest excess in the rate for males over that for females (170 percent) occurred for persons 15–24 years.

Public accidents and economic status.—Persons on relief [17] reported relatively more public accidents resulting in disability for 1 week or

[17] In the Health Survey, families were classified by income received during the 12 months preceding the interview and also by whether relief from official agencies had been received during that time. Persons in families with annual income under $1,000 comprised about 40 percent of the surveyed group, about 65 percent were in families with annual incomes under $1,500, and 80 percent in families with incomes under $2,000. Almost one-half of the lowest income group had been in receipt of relief during the year 1935.

more than did persons in the higher income brackets (table 3). Inclusion of motor-vehicle accidents to pedestrians probably accounts for much of the high rate among the relief group. The annual frequency rate of public accidents (all ages) decreased progressively from 7.73 for every 1,000 persons observed in the relief group to 6.10

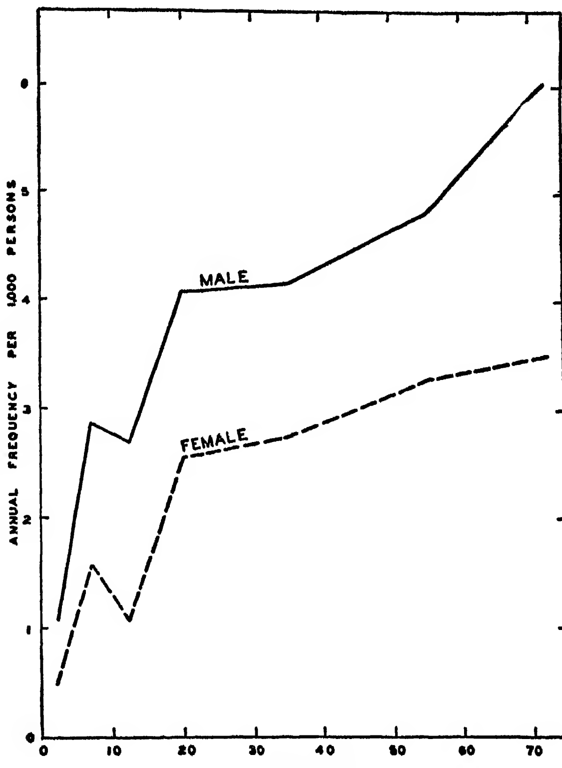


FIGURE 2.—Annual frequency (per 1,000 persons) of public accidents involving motor vehicles disabling for 1 week or more,[a] by age and sex.[b]

for the group with $1,500 to $2,000 annual family income and then rose to 6.56 for persons with annual family income of $2,000 and over. As is also evident from table 3, the pattern for all public accidents is repeated when the total is broken down into public accidents involving motor vehicles and public accidents exclusive of motor-vehicle accidents. The rate for the former (all ages) decreased progressively from 3.42 for every 1,000 persons in the relief group to 2.96 for the group with $1,500 to $2,000 annual family income and then increased to 3.19 for persons with $2,000 and more annual family income, while for the latter the rate (all ages) decreased progressively from 4.31 for persons in the relief group to 3.14 for the group with $1,500

to $2,000 annual family income and then increased to 3.37 for persons with annual family income of $2,000 and more.

Because of differences in the age composition of persons in the several income brackets and because the rate for serious public acci-

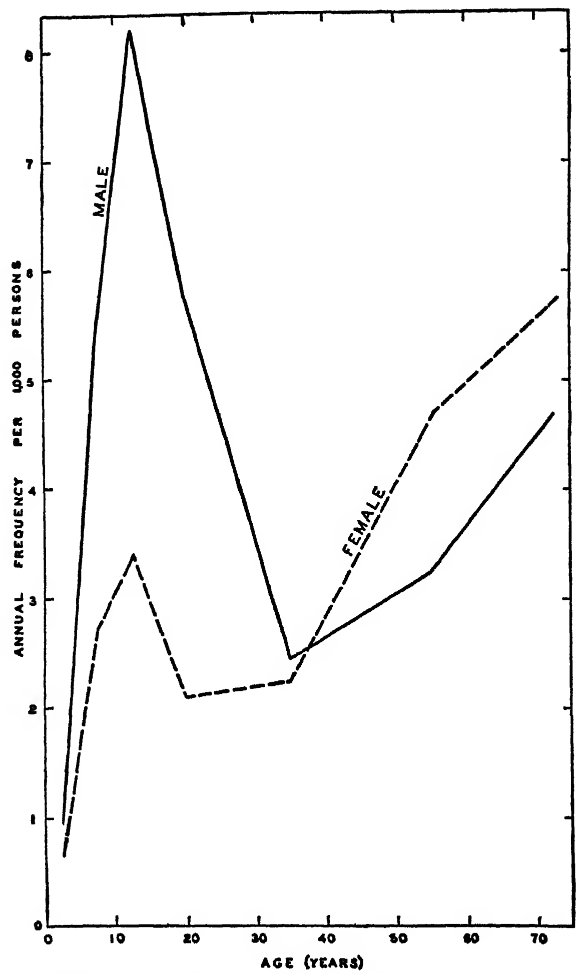


FIGURE 3.—Annual frequency (per 1,000 persons) of public accidents exclusive of motor-vehicle accidents disabling for 1 week or more,[a] by age and sex.[b]

dents increased with age, the actual (crude) rates for persons in families in each income group do not adequately describe the true relation between serious public accidents and economic status. Hence, the rates have been adjusted to a standard age distribution.[18]

[18] Within any income group the rate for public accidents disabling 1 week or more in each age group was multiplied by the total number of persons (all incomes) in that age group, the products were summed, and the sum was divided by the total number of persons. For standard population see figures given in *e* in references to tables and charts.

The resultant rates permit consideration of the relation between serious public accidents and economic status with the differential effect of one influencing factor—age—removed. The actual (or crude) and the adjusted rates as well as the rates by age for all public accidents and also for public accidents involving motor vehicles and for those not involving motor vehicles are shown in table 3 for different income groups.

TABLE 3.—*Annual frequency (per 1,000 persons) of public accidents disabling for 1 week or more,*[a] *by age and economic status* [*]

Annual family income and relief status	Age (years): All ages, Crude	All ages, Adjusted[1] (a)	All ages, Adjusted[1] (b)	Under 5	5-9	10-14	15-24	25-44	45-64	65 and over	Number of cases, all ages
	Total public accidents										
All incomes	6.60	6.60	6.60	1.63	6.32	7.73	7.04	5.78	8.00	9.94	[*] 16,487
Relief	7.73	8.01	7.80	2.22	6.72	8.89	7.72	7.07	10.14	11.13	3,496
Nonrelief:											
Under $1,000	6.60	6.49	6.90	1.30	5.63	7.11	6.68	5.72	8.52	10.12	3,806
$1,000 to $1,500	6.16	6.26	6.11	1.48	6.57	7.72	6.77	5.13	7.35	10.61	3,313
$1,500 to $2,000	6.10	6.13	6.02	1.47	6.20	7.20	7.21	5.32	6.85	8.89	2,401
$2,000 and over	6.56	6.46	6.47	1.33	6.51	7.27	7.57	5.67	7.60	8.48	2,879
	Public accidents involving motor vehicles										
All incomes	3.17	3.17	3.17	0.82	2.22	1.92	3.27	3.43	4.05	4.67	7,929
Relief	3.42	3.67	3.48	1.14	2.54	2.38	3.37	4.15	4.78	4.75	1,547
Nonrelief:											
Under $1,000	3.36	3.30	3.39	.83	2.37	2.15	3.38	3.54	4.16	4.93	1,936
$1,000 to $1,500	2.99	3.02	2.98	.83	2.23	1.83	3.19	3.07	3.83	5.19	1,607
$1,500 to $2,000	2.96	2.93	2.97	.65	2.00	1.59	3.35	3.17	3.66	4.00	1,164
$2,000 and over	3.19	3.05	3.21	.43	1.69	1.38	3.31	3.45	3.96	4.54	1,398
	Public accidents exclusive of motor-vehicle accidents										
All incomes	3.43	3.43	3.43	0.81	4.10	5.81	3.77	2.35	3.95	5.27	8,558
Relief	4.31	4.34	4.32	1.08	4.18	6.51	4.35	3.52	5.36	6.38	1,949
Nonrelief:											
Under $1,000	3.24	3.19	3.51	.48	3.26	4.96	3.30	2.18	4.36	5.19	1,870
$1,000 to $1,500	3.17	3.24	3.13	.65	4.34	5.89	3.58	2.06	3.52	5.42	1,706
$1,500 to $2,000	3.14	3.20	3.05	.81	4.20	5.61	3.86	2.15	3.19	4.89	1,237
$2,000 and over	3.37	3.41	3.26	.90	4.82	5.89	4.26	2.22	3.64	3.94	1,481

[1] Adjusted to (a) age and (b) city size and geographic area composition of all persons enumerated in the National Health Survey.

At each age the frequency of all public accidents disabling 1 week or more was greater for the relief group than for any other economic status group. But, as is evident from figure 4, the variation by economic status among persons of a particular age group was considerably different for public accidents involving motor vehicles from that for public accidents exclusive of motor-vehicle accidents. In the case of the former, among persons in the three youngest age groups

(under 5 years, 5–9 years, and 10–14 years), the rate decreased progressively with a rise in annual family income For persons 15–24 years and for persons 65 years and older the differences in the rates

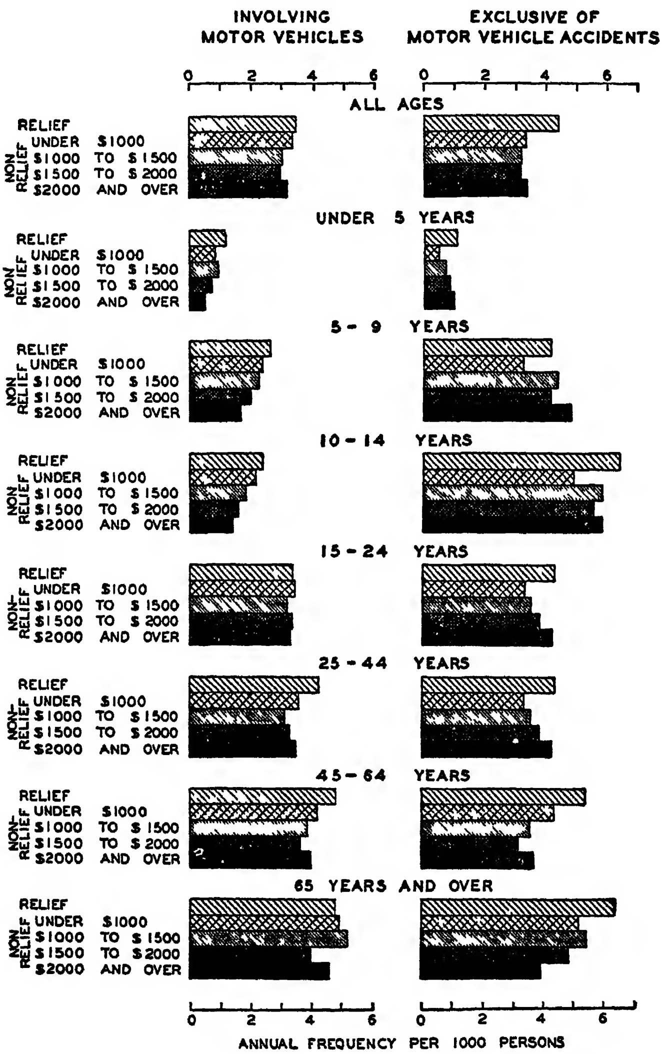


FIGURE 4 —Annual frequency (per 1 000 persons) of public accidents, disabling for 1 week or more [a] for each income group, by age [a]

by economic status were not significant [19] For the age groups 25–44 years and 45–64 years the greatest variation by economic status was the decrease in the rate for the relief group as compared with that for the nonrelief group with under $1,000 annual income (a decrease from 4 15 to 3 54 for persons 25–44 years, and 4 78 to 4 16 for persons

[19] Based on the use of the Chi square test using a 0 05 level of significance

45–64 years). Also, for both of these age groups the rate for the highest income group was greater than that for the two preceding income groups.

In the case of public accidents exclusive of motor-vehicle accidents (see fig. 4), in every age group except 5–9 years the rate for persons on relief was higher than that in any other economic status group. Among persons in the age groups under 25 years, the rate in general increased from the lowest rate for the group with under $1,000 annual family income to a rate for the highest income group which was almost as great as that for the relief group. Among persons 25–44 years the rate for the relief group was about 60 percent higher than the rate for any other economic status group, but there was no significant difference (see footnote 19) in the rates for the nonrelief economic status groups. For persons over 45 years the general trend was a decrease in the rate with increase in annual family income.

The annual frequency rates of public accidents were also adjusted[20] to investigate the possibility that elimination of the effect of size of city and location would result in a more accurate description of the relation between public accident rates and economic status (table 3). The adjusted rates decrease more pronouncedly than the crude rates with an increase in annual family income from the rate for the relief group to that for the group receiving from $1,500 to $2,000 annual family income. For the group with highest economic status ($2,000 and over) the increase over the rate for the previous economic status group is practically the same for the adjusted and crude rates. For public accidents involving motor vehicles (table 1) among persons on relief the adjusted rate is somewhat higher than the crude rate.

In figure 5 it is shown, by area and city size, that for persons under 15 years of age and persons 15–64 years the frequency rate of public accidents was higher for the relief group than for the nonrelief group. Of special significance in the case of public accidents involving motor vehicles is the excess of the rate for the relief group for persons under 15 years of age. Among persons 15–64 years, also, the rate for public accidents involving motor vehicles was higher among persons on relief than among those not on relief for each area and city size (except in the case of the rate for cities of 25,000 to 100,000 in the West, based on one city only).

In the case of public accidents exclusive of motor-vehicle accidents among persons 15–64 years, the rate for persons on relief was higher than for persons not on relief for each area and city size. Among

[20] Adjusted to city size and geographic area composition of all persons enumerated in the National Health Survey. (See f in references to tables and charts.)

persons under 15 years the rate for persons on relief was higher in cities of more than 25,000 population in all areas, but was lower for the Northeast and North Central cities of less than 25,000 population.

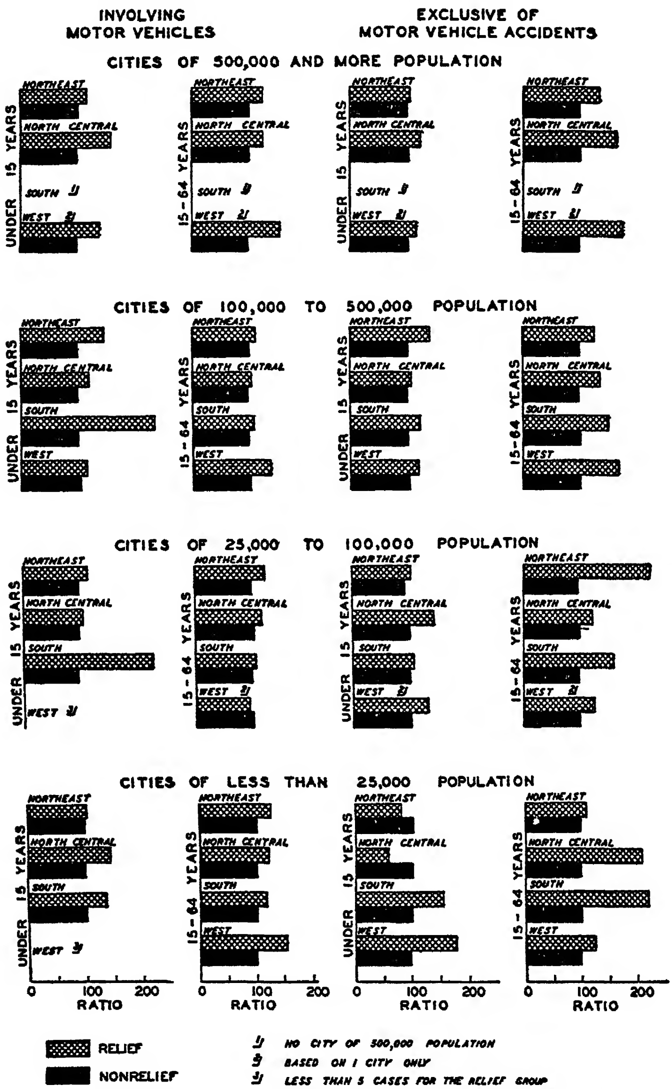


FIGURE 5.—Ratio of the annual frequency rate of public accidents disabling for 1 week or more for the relief group to the rate for the nonrelief group by geographic area, size of city, and specified age groups (nonrelief group=100).

Public accidents by means of injury.—The means of injury for public accidents have been grouped into the following six broad categories: Motor vehicles, transportation facilities (nonmotor vehicle), falls, cutting and piercing instruments, animals (including venomous), and

all other means.[21] The annual frequency per 1,000 persons of public accidents disabling for 1 week or more, according to such categories, was:

Motor vehicles	3.17
Transportation facilities (nonmotor vehicle)	.19
Falls [1]	2.63
Cutting and piercing instruments	.17
Animals (including venomous)	.066
All other means [2]	.37

[1] The annual frequency rates for the accidental traumatisms included in falls were as follows: Fall with fracture, 1.09 per 1,000 persons; fall with infected wound, 0.05; other falls, 1.02; sprain (unspecified as to means of injury), 0.12; fracture (unspecified as to means of injury), 0.34.

[2] In the "all other" group, the largest annual frequency rates were for firearms and fireworks and burns, being, respectively, 0.047 and 0.026 per 1,000 persons.

Motor vehicles caused over 48 percent of public accidents (disabling 1 week or more); other transportation facilities, 3 percent; falls, 40 percent; cutting and piercing instruments, 3 percent; animals (including venomous), 1 percent; and all other means, less than 6 percent.

The annual frequency rates per 1,000 persons according to means of injury, classified by age and sex, are shown in table 4.

TABLE 4.—*Annual frequency (per 1,000 persons) of public accidents disabling for 1 week or more,[a] by means of injury and by sex and age of persons observed [b]*

[Rates in *italics* based on less than 5 cases]

Sex and means of injury	Age (years)								Number of cases, all ages
	All ages	Under 5	5-9	10-14	15-24	25-44	45-64	65 and over	
Both sexes, all means	6.60	1.63	6.32	7.73	7.04	5.78	8.00	9.94	[c] 16,487
Motor vehicles	3.17	.82	2.22	1.91	3.27	3.43	4.05	4.67	7,929
Transportation facilities (nonmotor vehicle)	.19	.057	.24	.41	.24	.14	.14	.21	472
Falls	2.63	.57	3.00	4.16	2.59	1.77	3.38	4.70	6,561
Cutting and piercing instruments	.17	.063	.34	.44	.22	.13	.072	.10	428
Animals (including venomous)	.066	.051	.099	.15	.059	.050	.057	.049	164
All other means [1]	.37	.068	.42	.66	.67	.26	.30	.20	933
Male, all means	7.90	2.08	8.35	10.93	9.78	6.64	8.06	10.79	9,477
Motor vehicles	3.92	1.12	2.88	2.71	4.08	4.17	4.83	6.08	4,701
Transportation facilities (nonmotor vehicle)	.21	.078	.30	.55	.31	.13	.12	.13	254
Falls	2.87	.68	3.90	5.72	3.88	1.72	2.56	4.10	3,446
Cutting and piercing instruments	.27	.089	.50	.68	.36	.20	.11	.094	319
Animals (including venomous)	.078	*.033*	.13	.21	.058	.059	.059	*.079*	94
All other means	.55	.078	.63	1.04	1.09	.36	.38	.32	663
Female, all means	5.40	1.16	4.29	4.48	4.68	5.00	7.95	9.24	7,010
Motor vehicles	2.49	.51	1.57	1.11	2.57	2.76	3.29	3.53	3,228
Transportation facilities (nonmotor vehicle)	.17	*.035*	.18	.26	.18	.14	.17	.28	218
Falls	2.40	.45	2.09	2.56	1.48	1.81	4.19	5.18	3,115
Cutting and piercing instruments	.085	*.035*	.17	.19	.096	.062	.036	.11	109
Animals (including venomous)	.054	.070	.069	.030	.058	.042	.057	*.025*	70
All other means	.21	.059	.21	.29	.29	.19	.21	.12	270

[1] The largest groups were firearms and fireworks with a rate of 0.047 per 1,000 (all ages) and burns, 0.026.

[21] "Falls" relates to falls of persons and includes fractures and sprains unspecified as to means of injury. "Cutting and piercing instruments" includes infected wounds unspecified as to means of injury. The "all other" group is made up largely of firearms and fireworks, burns, drownings, machinery, and of poisonings (gas, food, plants, etc.).

As is evident from figure 6, at every age the rates for falls and for motor-vehicle accidents were very much higher than the rates for any other means of injury. Among persons under 5 years of age the rate for falls was somewhat lower than the rate for motor-vehicle accidents; among persons 5–9 years of age the rate for falls was approximately one and one-third times as high as the rate for motor-vehicle accidents; and among persons 10–14 years of age the rate was over twice as high. After age 15, while the rate for motor-vehicle

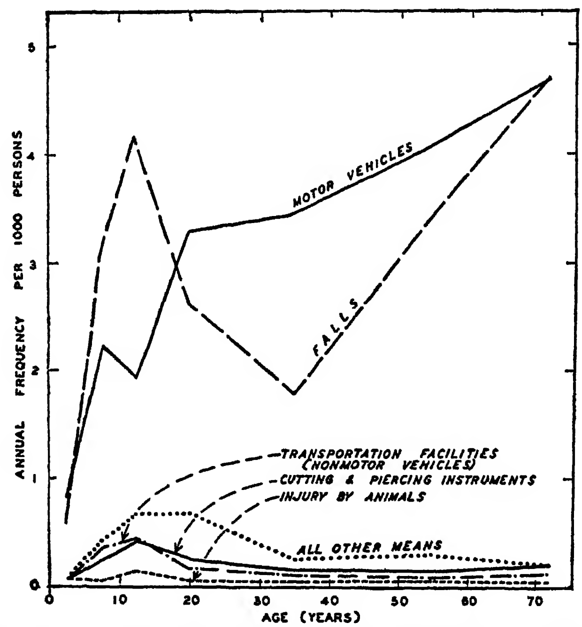


FIGURE 6.—Annual frequency (per 1,000 persons) of public accidents disabling for 1 week or more,[a] by age and means of injury.[b]

accidents increased steadily with age from 3.27 for persons 15–24 years to 4.67 for persons 65 years and over, the rate for falls decreased from 2.59 for persons 15–24 years to 1.77 for persons 25–44 years of age and then rose steeply to 4.70 for persons 65 years and older.

Although the rates for the other means of injury were very much smaller than those for falls, the variation with age was similar. For transportation facilities (other than motor vehicles), cutting and piercing instruments, and animals there was an increase in the rates from infancy to 15 years of age, a decrease from 15–64, and an increase for persons 65 years and over (except in the case of injury by animals for which the rate among persons 45–64 years was higher than that for the preceding or following age groups).

As is also shown in table 4, for each means of injury the rate among males was higher than that among females, the smallest excess in the

rate for males over that for females being for falls and the greatest (besides the "all other" group), for motor-vehicle accidents. Moreover, at every age for each means of injury the rate among males was higher than that among females except in the case of transportation facilities (nonmotor vehicle) and falls among persons 25 years and over and for cutting and piercing instruments among persons 65 years and over (considering only rates based on at least 5 cases).

Figure 7 gives the percentage distribution of public accidents disabling for 1 week or more by means of injury and age, showing again

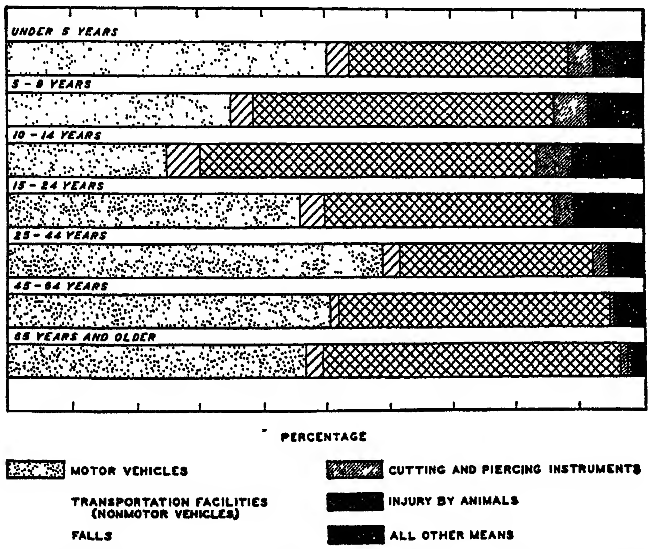


FIGURE 7.—Percentage distribution of public accidents disabling for 1 week or more [a] by means of injury in different age groups.[b]

that for each age group the proportion of all public accidents due to motor vehicles and the proportion due to falls was very much higher than that due to any other means of injury. For persons under 5 years, motor vehicles were the means of injury in a higher percentage of cases than falls; for persons 5–14 years of age, falls were the means of injury in a higher percentage of cases than were motor vehicles; for persons 15–64 years of age, accidents involving motor vehicles were most frequent; and for persons 65 years and over the percentage of public accidents due to motor vehicles was approximately the same as the percentage due to falls (46.98 and 47.28 percent, respectively).

Although, in comparison with public accidents due to motor vehicles or falls, those involving transportation facilities (other than motor vehicle), cutting and piercing instruments, animals, and the "all other" group occurred very infrequently, there was, nevertheless, considerable variation with age in the proportion due to these various

means of injury. The proportion of all public accidents due to transportation facilities other than motor vehicles increased from 3.5 percent for persons under 5 years to 5.3 percent for persons 10–14 years, then decreased steadily to 1.8 percent for persons 45–64 years, and rose to 2.1 for persons 65 years and older. The variation with age in the proportion due to cutting and piercing instruments was similar to that for falls. The proportion increased from 3.9 percent for persons under 5 years to 5.7 for persons 10–14 years, then decreased steadily to 0.90 for persons 45–64 years, and rose to 1.1 for persons 65 years and older. For persons under 5 years of age the proportion of public accidents due to injury by animals (3.1 percent) was very much greater than for any other age group.

SUMMARY

This report, the second of a series on accidents, summarizes National Health Survey data on serious accidents occurring in public places among some 2,500,000 white and colored persons in over 700,000 families in 83 cities of the United States.[22]

Frequency and disability.—Among persons enumerated in the National Health Survey the annual frequency rate of accidents which disabled for 1 week or more (48 percent of which were motor-vehicle accidents) was 6.60 per 1,000 persons, or 3.9 percent of all cases of disability (from disease and accident) lasting 1 week or more as reported in the National Health Survey. The annual frequency rate of accidents occurring in public places which disabled persons for 1 month or more within the 12-month period was 3.60 per 1,000 persons, or 1.83 for public accidents involving motor vehicles and 1.77 for public accidents exclusive of motor-vehicle accidents.

The annual number of days of disability from accidents occurring in public places (disabling for 1 week or more) per person in the observed population was 0.33, 55 percent of which was due to accidents involving motor vehicles. The average duration of disability (within the 12-month period) from accidents occurring in public places was 51 days; from public accidents involving motor vehicles, 57 days; and from public accidents exclusive of motor-vehicle accidents, 45 days.

Sex and age.—The annual frequency rate of recorded public accidents was over 46 percent higher for males than for females, being 7.90 per 1,000 persons for the former and 5.40 for the latter. From infancy to 15 years of age the rate (both sexes) increased from 1.63 for

[22] The first report in the series on accidents was entitled, Accidents in the urban home as recorded in the National Health Survey, by Rollo H. Britten, Joan Klebba, and David E Hailman Pub Health Rep, 55: 2061 (1940)

For data on accidents, all places of occurrence, based on 8 cities selected from the 83 covered in the National Health Survey, see, Accidents as a cause of disability, Preliminary Report, Sickness and Medical Care Series, Bulletin No 3, prepared by Arch B Clark of the National Health Survey staff.

children under 5 years to 7.73 for children 5–14 years, decreased to 5.78 for persons 25–44 years, and rose to 9.94 for persons 65 years and older. The excess in the rate for males over that for females was greater for public accidents involving motor vehicles (57 percent) than for public accidents exclusive of motor vehicles (37 percent). There was little difference in the number of public accidents involving motor vehicles and the number exclusive of motor vehicles for persons under 5 years, but the latter were more frequent among persons 5–24 years of age and persons 65 years and over, while the former were more frequent for persons 25–64 years of age. The annual number of days of disability per person observed (within the 12-month period) increased with advancing age, public accidents involving motor vehicles causing fewer days of disability than those exclusive of motor vehicles among persons under age 15 and more among persons 15–64 years of age. Also, the average length of periods of disability for accidents occurring in public places increased with age, and was higher at every age for public accidents involving motor vehicles than for those exclusive of motor vehicles. For public accidents exclusive of motor-vehicle accidents, however, the average length of periods of disability decreased from 34 days for children under 5 years to 31 days for children 10–14 years, and then increased steadily with age to 74 days for persons 65 years and older.

At each age group the annual frequency rate was higher for males than for females. For persons under 25 years of age the great excess in the rate for males over that for females was primarily due to public accidents exclusive of motor-vehicle accidents.

Economic status.—For each age group persons on relief reported relatively more public accidents resulting in disability of 1 week or more than did persons in the higher income brackets. For public accidents involving motor vehicles the rate decreased progressively with rise in annual family income among persons in the age groups under 15 years, did not vary significantly with increased income for persons 15–24 years or for persons 65 years and older, and decreased with an increase in annual family income up to $1,500 for persons 25–44 and up to $2,000 for persons 45–64 years. For public accidents exclusive of motor vehicles, the rate for persons on relief is higher than the rate for persons in any other economic status group except for persons 5–9 years of age. Among persons under 25 years the rate increased with rise in income from the low rate for the income group under $1,000 (nonrelief). Among persons 25–44 years the relief rate was very high but there was no significant variation in the rates for the nonrelief groups, and among persons over 45 years the general trend was a decrease with increase in annual family income. Also, the proportion of persons having public accidents was higher among

the relief group than among the nonrelief group for each area and city size.

Means of injury.—Motor vehicles were the means of injury in 48 percent of public accidents (disabling 1 week or more), falls in 40 percent, transportation facilities other than motor vehicles in 3 percent, cutting and piercing instruments in 3 percent, animals (including venomous) in 1 percent, and all other means in less than 6 percent. For each age group the rates for motor-vehicle accidents and for falls were very much higher than the rates for any other means. Until about age 15 the rate for falls was much higher than that for motor vehicles, after which age the reverse was true until after 65 years of age when the rate for falls was again slightly higher than that for motor vehicles. For transportation facilities (other than motor vehicles), cutting and piercing instruments, and animals, there was an increase in the rates from infancy to age 15, a decrease from age 15 to 65, and an increase with age for persons 65 years and over (except in the case of injury by animals for which the rate among persons 45–64 years was higher than that for the preceding or following age groups).

For each means of injury and at every age (except in the case of transportation facilities other than motor vehicle, falls among persons 25 years of age and over, and cutting and piercing instruments for persons 65 years and over) the rate for males was higher than that for females.

REFERENCES TO TABLES AND CHARTS

(These references are to be considered as supplementary to the basic description of the National Health Survey technique and definitions which have been given in "Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting," by George St. J. Perrott, Clark Tibbitts, and Rollo H. Britten. Pub. Health Rep., **54:** 1663 (1939). Reprint No. 2098.)

a Includes a small number of cases with disability of less than 7 days, but which had hospital care or resulted in death.

b Based on 2,498,180 persons of known age in 83 cities, distributed by age and sex as follows:

	All ages	Under 5 years	5-9 years	10-14 years	15-24 years	25-44 years	45-64 years	65 years and over
Both sexes	2,498,180	175,653	202,770	224,391	446,369	820,826	485,762	142,409
Male	1,200,728	89,214	101,917	112,076	206,696	388,002	239,187	63,636
Female	1,297,452	86,439	100,853	112,315	239,673	432,824	246,575	78,773

c Excludes 10 public accidents (of a total of 16,497) unknown as to age of persons observed.

d Excludes 299 public accidents (of a total of 16,497) unknown as to age of persons observed and/or duration of disability.

e Rate for all incomes (including unknown) based on 2,498,180 persons of known age in 83 cities, distributed by age and income as follows:

	Under 5 years	5–9 years	10–14 years	15–24 years	25–44 years	45–64 years	65 years and over
All incomes (including unknown)	175, 653	202, 770	224, 391	446, 369	820, 826	485, 762	142. 409
Relief	46, 431	53, 059	57, 126	83, 038	119, 426	71, 497	22, 087
Nonrelief:							
Under $1,000	39, 943	42, 974	47, 388	102, 079	183, 679	114, 840	45, 815
$1,000 to $1,500	39, 739	44, 423	47, 021	93, 358	189, 221	97, 902	26, 002
$1,500 to $2,000	21, 558	29, 538	33, 332	68, 418	142, 100	77, 954	18, 001
$2,000 and over	21, 086	27, 814	33, 291	77, 147	155, 518	100, 659	23, 347

Rates for persons of unknown income based on 277 cases among 98,369 persons are not shown.

f Based on 2,498,180 persons of known age distributed by area and size of city as shown in "The relief and income status of the urban population of the United States, 1935," National Health Survey, Preliminary Reports, Bulletin C, table 5, page 9.

THE ORAL TRANSMISSION OF *PLASMODIUM RELICTUM* IN THE PIGEON

By MARTIN D. YOUNG, *Associate Zoologist, Malaria Investigations, United States Public Health Service*

Any new approach to the problem of transmission of malaria is of vital importance and might throw light on the development of the parasite between its entrance into the body and its appearance in the blood stream. Recently, Shortt and Menon (*1*) have reported the oral transmission of *Plasmodium knowlesi* in monkeys and *P. gallinaceum* in chickens. The far-reaching implications of this work indicates the necessity of confirming the experiments and of determining how many species of malaria can be transmitted by this route.

In the present experiments the malaria parasite of pigeons, *P. relictum*, was used. Blood was drawn from the donors by heart puncture and citrated. At the time of administration, most of the parasites were mature segmenters or had just segmented. In the oral administrations the blood was put into the crop by the use of a ureter catheter attached to a syringe. The control birds received blood by heart puncture. The data on these infections are tabulated in table 1.

In the first transfer, orally inoculated pigeons 421 and 422 developed the infection, as well as the control pigeon 420C. Infected blood from orally inoculated pigeon 421 was given to pigeon 425C by heart puncture. The resulting infection indicated that the parasites were viable.

TABLE 1.—*Data on oral and heart puncture inoculations of pigeons with Plasmodium relictum*

Pigeon	Infected blood			Resulting infection		Remarks
	Source	Amount given	Route	Prepatent period, days	Intensity	
420C	414	3 cc.	Heart	3	Heavy	Died of infection.
421	414	8 cc.	Oral	7	Low	
422	414	8 cc.	do	13	Heavy	Do.
425C	421	8 cc.	Heart	4	do	Killed.
429	425C	8 cc.	Oral	16	Low	
506	425C	1 cc.	do	6	do	
502	422	1 cc.	do	21	Heavy	Second oral transfer.
504	422	4 cc.	do	23	Low	Do.
505	422	4 cc.	do	11	Heavy	Do.

For the second consecutive oral transfer, pigeon 422 was used as the donor. Pigeons 502, 504, and 505 received the infected blood orally and developed infections. The amount of blood given was smaller than in the first transfer; even 1 cc. produced a heavy infection (pigeon 502).

So far, 10 pigeons have received infected blood by the oral route, and 7 of these have developed infections. The malaria has been transferred through two consecutive passages by oral administration.

Although the possibility of the entrance of the parasites directly into the blood stream through an abrasion in the mucosa of the crop cannot be excluded, such an entrance is not considered probable in these experiments. Eliminating this possibility, the development of the malarial infection after oral administration indicates that the parasites enter the body tissues through the alimentary tract, either by the activity of the parasites or by the activity of the tissue cells. This adds further evidence to that recently obtained on the exoerythrocytic forms of malaria, indicating that these parasites may be able to live in types of tissue other than blood.

REFERENCE

(1) Shortt, H. E., and Menon, K. P.: Experimental production of monkey and avian malaria by an unusual route of infection. J. Malaria Institute of India, 3: 195–198 (1940).

COURT DECISION ON PUBLIC HEALTH

Amendment to restaurant licensing law held void.—(Wisconsin Supreme Court; *State ex rel. F. W. Woolworth Co.* v. *State Board of Health et al.*, 298 N.W. 183; decided May 20, 1941.) (Chapter 440 of the Wisconsin Laws of 1935 added to the Wisconsin statute relating to the licensing of restaurants a subsection which provided that no permit should be issued to operate or maintain any restaurant where

there was conducted any other business, except the sale of fermented malt and nonintoxicating beverages, intoxicating liquors, chewing gum, candies and other confections, or newspapers, unless such restaurant and the kitchens or other places used in connection therewith were completely and effectively separated from such other business in the same room or place by substantial partitions extending from the floor to the ceiling with self-closing doors for ingress and egress. The provisions of this subsection were applicable only to restaurants commencing business after the effective date of the subsection.

In a mandamus proceeding in which it was sought to compel the State board of health to grant a permit to conduct a restaurant, it was contended by the relator that the added subsection was void under the Federal and State constitutions as denying to it due process and equality before the law. The supreme court took the view that the contention of the relator had to be sustained and said that, the amendment being void, the existing statute remained in force. The basis for licensing the business involved, said the court, was that it was required for the protection of the public health and safety. "If protection of the public health and safety requires partitions in case of a business subsequently to be commenced, then by the same token it requires them in case of existing businesses; and if one operating an existing restaurant is not required to maintain the partition, and one about to establish a restaurant is required to maintain one, then manifestly the latter is denied equal protection with the former."

DEATHS DURING WEEK ENDED JUNE 28, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 28, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	8,585	7,505
Average for 3 prior years	7,469	
Total deaths, first 26 weeks of year	230,242	230,629
Deaths per 1,000 population, first 26 weeks of year, annual rate	12.4	12.4
Deaths under 1 year of age	547	492
Average for 3 prior years	514	
Deaths under 1 year of age, first 26 weeks of year	13,625	13,185
Data from industrial insurance companies:		
Policies in force	64,419,021	65,146,174
Number of death claims	11,150	11,776
Death claims per 1,000 policies in force, annual rate	9.0	9.5
Death claims per 1,000 policies, first 26 weeks of year, annual rate	10.1	10.3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 5, 1941

Summary

A total of 82 cases of poliomyelitis was reported for the current week, as compared with 79 cases for the preceding week, and with a 5-year (1936–40) median of 71. As compared with the preceding week, the number of cases in Georgia decreased from 23 to 19, in Florida from 10 to 6, and in California from 7 to 3, while increases were recorded for Alabama, from 10 to 22, Illinois, from 0 to 5, Pennsylvania, from 1 to 4, and Texas, from 2 to 4. The total number of cases reported to date (first 27 weeks) for the country as a whole is 796 as compared with 847 cases in 1940, which was also the median number of cases reported for the corresponding period of the past 5 years. For this period, 1,071 cases were reported in 1937 and 868 in 1939.

The highest incidence rates so far this year have been reported in the South Atlantic States, where Florida and Georgia have reported 166 of the 236 cases; in the Pacific States, where California has reported 70 of the 90 cases; in the Mountain States, where Montana has reported 10 of the 32 cases; and in the East South Central area (Mississippi, 31; Alabama, 46; Kentucky, 23; and Tennessee, 12).

A total of 8,339 cases of measles was reported, as compared with 12,699 for the preceding week. Of 47 cases of endemic typhus fever, 24 cases were reported in Georgia and 14 in Texas; and of 16 cases of Rocky Mountain spotted fever, 8 were reported in the Mountain States and 8 in the eastern and central States.

The death rate for the current week in 88 major cities of the United States is 10.9 per 1,000 population, as compared with 12.0 for the preceding week, and with a 3-year average of 10.1. The cumulative rate for these cities to date (first 27 weeks) this year is 12.3, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended July 5, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	July 5, 1941	July 6, 1940		July 5, 1941	July 6, 1940		July 5, 1941	July 6, 1940		July 5, 1941	July 6, 1940	
NEW ENG.												
Maine	0	1	0				59	147	21	0	0	0
New Hampshire	0	0	0				0	0	9	0	0	0
Vermont	0	0	0				61	19	30	0	0	0
Massachusetts	0	0	1				553	824	361	0	0	1
Rhode Island	0	0	0				1	53	20	0	0	0
Connecticut	0	1	1	2		1	240	15	43	0	0	0
MID. ATL.												
New York	8	10	21	[1]8	[1]4	[1]1	985	573	738	4	3	4
New Jersey	1	2	6		1	1	360	258	258	0	0	0
Pennsylvania [2]	6	9	18				1,294	272	616	2	2	5
E. NO. CEN.												
Ohio	3	6	8	5	16	5	651	40	197	1	2	2
Indiana	4	2	6	2	2	4	99	4	15	0	0	0
Illinois	7	8	25	1	5	4	236	150	150	1	1	1
Michigan [3]	0	1	6	1			406	230	230	0	0	1
Wisconsin	0	0	1	9	5	8	735	643	216	0	0	0
W. NO. CEN.												
Minnesota	1	0	1	1	2		11	27	31	0	0	0
Iowa [2]	1	2	2		1		69	156	101	0	0	0
Missouri [2]	1	0	3	2		6	150	18	16	0	0	0
North Dakota	0	0	0	13			12	3	3	1	0	1
South Dakota	10	4	1				5	3	3	0	0	0
Nebraska	0	1	1				16	7	7	0	1	1
Kansas	5	3	3	15	2		60	99	12	1	0	0
SO. ATL.												
Delaware	0	0	0				14	1	2	0	0	0
Maryland [2] [3]	5	0	8		2	1	314	10	17	6	1	0
Dist. of Col.	1	1	2				60	2	34	1	0	0
Virginia [2]	4	2	6	69	25		311	56	89	1	0	2
West Virginia [3]	4	2	3	4	2	3	181	9	15	1	0	0
North Carolina [4]	3	1	5		2	1	237	35	37	0	0	2
South Carolina	1	6	4	74	93	90	192	8	14	1	0	1
Georgia [4]	9	3	7	5	13		102	43		0	0	0
Florida [4]	1	0	1	10			12	9	9	1	0	1
E. SO. CEN.												
Kentucky	0	1	3		1	1	44	56	45	1	2	3
Tennessee [2]	1	3	4	11	12	12	84	27	41	0	2	3
Alabama [4]	2	1	6		3	3	27	133	39	1	0	0
Mississippi [3] [4]	7	3	4							0	0	1
W. SO. CEN.												
Arkansas	2	0	3	6	4	6	71	12	10	0	0	0
Louisiana [4]	1	1	6	1	9	9	3	3	5	1	1	0
Oklahoma	3	4	4	11	10	10	74	12	12	0	3	1
Texas [4]	18	8	14	264	61	61	196	171	99	1	1	0
MOUNTAIN												
Montana [2]	3	1	0				7	31	8	0	0	0
Idaho	1	0	0		1		7	4	3	0	0	0
Wyoming [2]	0	1	1				6	14	3	1	0	0
Colorado [2]	4	15	8	12	1		54	16	16	0	0	0
New Mexico	2	2	2	1			48	32	14	0	0	0
Arizona	0	0	1	35	18	18	77	36	17	0	0	0
Utah [3]	1	0	1	2			9	79	46	0	0	0
Nevada [2]	0						3			0		
PACIFIC												
Washington	8	2	2				15	63	63	0	0	0
Oregon	1	3	1	9		4	21	48	14	0	0	0
California	5	16	22	30	17	11	167	136	394	2	2	2
Total	129	126	287	598	312	312	8,339	4,587	4,587	28	21	32
27 weeks	6,720	7,898	11,937	595,961	166,984	149,771	809,463	212,527	259,498	1,237	1,004	1,926

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 5, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis: Week ended— July 5, 1941	Poliomyelitis: Week ended— July 6, 1940	Poliomyelitis: Median 1936–40	Scarlet fever: Week ended— July 5, 1941	Scarlet fever: Week ended— July 6, 1940	Scarlet fever: Median 1936–40	Smallpox: Week ended— July 5, 1941	Smallpox: Week ended— July 6, 1940	Smallpox: Median 1936–40	Typhoid and paratyphoid fever: Week ended— July 5, 1941	Typhoid and paratyphoid fever: Week ended— July 6, 1940	Typhoid and paratyphoid fever: Median 1936–40
NEW ENG.												
Maine	0	0	0	3	2	4	0	0	0	2	1	1
New Hampshire	0	0	0	0	0	1	0	0	0	0	0	0
Vermont	0	0	0	0	0	2	0	0	0	0	0	0
Massachusetts	[5] 0	1	1	65	54	73	0	0	0	3	2	2
Rhode Island	0	1	0	2	4	6	0	0	0	0	0	0
Connecticut	0	0	0	12	20	20	0	0	0	0	0	0
MID. ATL.												
New York	3	1	3	140	170	170	0	0	0	5	6	6
New Jersey	1	0	1	32	65	51	0	0	0	2	2	3
Pennsylvania [2]	4	2	0	78	100	128	0	0	0	7	13	13
E. NO. CEN.												
Ohio	1	3	1	113	105	98	0	0	1	7	8	9
Indiana	0	2	1	13	7	27	0	1	3	2	1	5
Illinois	5	1	2	65	133	133	4	4	4	14	4	6
Michigan [3]	0	1	1	98	67	135	2	0	0	6	2	2
Wisconsin	0	1	1	34	50	57	2	2	2	0	1	1
W. NO. CEN.												
Minnesota	2	1	0	15	32	32	2	1	5	0	0	0
Iowa [3]	0	1	0	9	15	18	0	9	16	3	3	2
Missouri [3]	0	0	1	0	12	19	0	0	6	7	5	6
North Dakota	0	0	0	4	4	4	0	0	3	0	1	0
South Dakota	0	0	0	4	2	6	0	4	4	0	0	0
Nebraska	0	1	0	7	8	8	0	0	1	0	0	0
Kansas	0	4	0	15	21	25	0	1	0	3	3	4
SO. ATL.												
Delaware	0	0	0	4	1	2	0	0	0	0	2	0
Maryland [2 3]	0	0	0	27	11	12	0	0	0	6	2	2
Dist. of Col.	0	0	0	3	11	5	0	0	0	0	0	0
Virginia [3]	0	2	1	5	8	11	0	0	0	3	12	16
West Virginia [3]	0	2	0	13	10	11	0	1	1	2	5	5
North Carolina [4]	1	1	1	9	18	15	0	0	0	9	4	11
South Carolina	3	0	0	1	1	2	0	0	0	5	14	21
Georgia [4]	19	0	3	3	9	8	0	0	0	20	21	25
Florida [4]	6	1	1	1	1	1	0	0	0	2	4	1
E. SO. CEN.												
Kentucky	2	2	1	25	8	12	0	0	0	13	7	23
Tennessee [3]	0	0	1	14	11	13	1	1	0	10	3	24
Alabama [4]	22	1	4	5	14	9	0	2	2	5	5	10
Mississippi [3]	6	2	2	2	2	4	0	0	0	11	8	13
W. SO. CEN.												
Arkansas	0	0	0	0	3	2	0	0	0	8	8	16
Louisiana [4]	0	0	0	1	4	4	0	0	0	9	12	20
Oklahoma	0	8	3	9	9	9	3	1	1	9	13	13
Texas [4]	4	1	1	25	20	20	1	2	2	48	30	43
MOUNTAIN												
Montana [3]	0	1	0	10	12	12	0	0	18	1	0	1
Idaho	0	1	0	1	5	2	0	0	2	0	0	0
Wyoming [3]	0	0	0	0	5	5	0	0	0	1	0	0
Colorado [3]	0	0	0	8	2	11	0	1	1	2	0	2
New Mexico	0	0	0	1	1	3	0	0	0	5	3	3
Arizona	0	0	1	1	2	2	2	0	0	1	0	3
Utah [3]	0	0	0	0	6	9	0	0	0	0	0	1
Nevada [3]	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	15	0	7	19	14	0	1	2	0	4	4
Oregon	0	0	0	5	9	7	3	0	2	0	1	1
California	3	14	8	35	57	63	0	0	3	6	5	5
Total	82	71	71	922	1,130	1,283	20	31	107	237	215	361
27 weeks	[5] 796	847	847	87,779	114,067	131,647	1,133	1,794	7,466	2,691	2,861	4,164

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 5, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— July 5, 1941	Whooping cough, Week ended— July 6, 1940
NEW ENG.		
Maine	25	22
New Hampshire	1	0
Vermont	0	14
Massachusetts	101	84
Rhode Island	18	8
Connecticut	42	26
MID. ATL.		
New York	226	245
New Jersey	53	52
Pennsylvania [2]	314	238
E. NO. CEN.		
Ohio	346	243
Indiana	9	17
Illinois	75	88
Michigan [3]	223	146
Wisconsin	103	88
W. NO. CEN.		
Minnesota	68	39
Iowa [2]	47	63
Missouri [2]	6	36
North Dakota	28	6
South Dakota	7	4
Nebraska	17	9
Kansas	149	50
SO. ATL.		
Delaware	2	4
Maryland [2, 5]	84	128
Dist. of Col.	9	3
Virginia [2]	112	69
West Virginia [3]	57	46
North Carolina [4]	185	123
SO. ATL.—continued		
South Carolina	91	22
Georgia [4]	15	37
Florida [4]	8	10
E. SO. CEN.		
Kentucky	45	61
Tennessee [2]	43	62
Alabama [4]	14	16
Mississippi [3, 4]	----------	----------
W. SO. CEN.		
Arkansas	22	37
Louisiana [4]	12	4
Oklahoma	25	17
Texas [4]	274	234
MOUNTAIN		
Montana [2]	14	6
Idaho	10	7
Wyoming [2]	0	17
Colorado [2]	98	9
New Mexico	42	22
Arizona	31	3
Utah [3]	28	103
Nevada [2]	12	----------
PACIFIC		
Washington	52	29
Oregon	26	16
California	318	287
Total	3,476	2,850
27 weeks	123,174	86,536

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended July 5, 1941, 16 cases, as follows: Pennsylvania, 1; Iowa, 1; Missouri, 1; Maryland, 2; Virginia, 1; Tennessee, 2; Montana, 1; Wyoming, 4; Colorado, 2; Nevada, 1.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended July 5, 1941, 47 cases, as follows: North Carolina, 2; Georgia, 24; Florida, 1; Alabama, 4; Mississippi, 1; Louisiana, 1; Texas, 14.
[5] Information has been received that the report of 1 case of poliomyelitis in Massachusetts for the week ended Apr. 12, 1941, Public Health Reports of Apr. 18, p. 802, was an error, no case having occurred.

PLAGUE INFECTION IN CALIFORNIA

Under the respective dates of June 24 and 27, 1941, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved as follows:

IN FLEAS FROM RATS IN CONTRA COSTA COUNTY

In a pool of 5 fleas from 68 rats, *R. norvegicus*, submitted to the laboratory on June 3 from a garbage dump approximately 2 miles northwest of City Hall, Richmond, Contra Costa County, Calif.

IN A RAT IN SAN FRANCISCO

In a rat, *R. norvegicus*, trapped on May 28, at 1740 Kirkwood Avenue, San Francisco, Calif.

Dr. Bertram P. Brown, State Director of Public Health of California, in reports forwarded under date of June 26, reported plague infection proved in fleas as follows:

IN FLEAS FROM SQUIRREL BURROWS IN KERN COUNTY

In a pool of 161 fleas submitted to the laboratory on June 10 from squirrel burrows on a ranch 2 miles south of Davis Ranger Station, Kern County, Calif.

IN FLEAS FROM GROUND SQUIRRELS IN KERN COUNTY

In a pool of 84 fleas from 5 ground squirrels, *C. beecheyi*, submitted on June 11 from a ranch 6 miles south of Davis Ranger Station, and in another pool of 201 fleas from ground squirrels of the same species submitted on June 6 from a ranch 3 miles south of Davis Ranger Station.

IN FLEAS FROM GROUND SQUIRRELS IN LOS ANGELES COUNTY

In a pool of 41 fleas from 4 ground squirrels, *C. beecheyi*, submitted to the laboratory on June 12 from Gorman Dump, one-half mile east of Gorman, Los Angeles County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 21, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	101	31	16	2,734	313	884	10	355	35	1,218	--------
Current week [1]	49	24	16	3,373	212	833	2	316	20	1,256	--------
Maine:											
Portland	0	1	0	1	2	0	0	0	0	12	23
New Hampshire:											
Concord	------	------	------	------	------	------	------	------	------	------	------
Nashua	0	------	0	0	0	0	0	0	0	0	4
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	1
Massachusetts:											
Boston	3	------	0	165	11	76	0	8	1	35	201
Fall River	1	------	0	4	0	5	0	0	0	2	32
Springfield	0	------	0	51	1	6	0	0	0	10	37
Worcester	0	------	0	12	1	7	0	0	0	4	38
Rhode Island:											
Pawtucket	1	------	0	0	0	0	0	0	0	1	21
Providence	0	------	0	1	2	2	0	1	0	18	46
Connecticut:											
Bridgeport	0	------	0	12	2	2	0	1	0	6	31
Hartford	0	------	0	5	0	1	0	0	0	0	23
New Haven	0	------	0	6	0	9	0	2	0	0	28
New York:											
Buffalo	0	------	0	44	3	31	0	5	0	9	108
New York	13	------	2	442	35	153	0	78	6	88	1,358
Rochester	0	------	0	116	1	2	0	0	0	12	60
Syracuse	0	------	0	19	2	8	0	0	1	34	39
New Jersey:											
Camden	0	------	0	4	2	7	0	1	0	1	44
Newark	0	------	0	39	3	7	0	5	0	16	80
Trenton	0	------	0	31	2	11	0	1	0	0	38
Pennsylvania:											
Philadelphia	2	1	1	77	7	86	0	15	1	50	414
Pittsburgh	0	------	0	396	6	20	0	11	1	40	149
Reading	0	------	0	23	0	2	0	1	0	0	28
Ohio:											
Cincinnati	3	------	0	9	3	7	0	8	0	7	107
Cleveland	0	2	0	6	4	28	0	9	0	68	163
Columbus	0	------	0	30	2	1	0	5	0	5	78
Toledo	0	------	0	330	1	3	0	3	0	23	78
Indiana:											
Anderson	0	------	0	13	0	0	0	0	0	0	4
Fort Wayne	0	------	0	2	2	2	0	2	0	0	32
Indianapolis	0	------	0	97	0	4	0	1	1	6	66
Muncie	0	------	0	9	1	2	0	0	0	0	12
South Bend	0	------	0	6	1	0	0	0	0	0	12
Terre Haute	0	------	0	1	0	0	0	0	0	0	19
Illinois:											
Alton	0	------	0	7	1	0	1	0	0	0	11
Chicago	11	------	0	68	15	96	0	21	1	51	642
Elgin	0	------	0	1	0	0	0	0	0	3	5
Moline	0	------	0	6	0	0	0	0	0	0	7
Springfield	0	------	0	45	1	0	0	0	0	0	26
Michigan:											
Detroit	1	------	0	216	11	90	0	15	1	67	259
Flint	0	------	0	12	0	1	0	0	0	11	31
Grand Rapids	0	------	0	48	0	12	0	0	0	2	35
Wisconsin:											
Kenosha	0	------	0	7	0	1	0	0	0	0	10
Madison	0	------	0	14	0	4	0	0	0	1	13
Milwaukee	1	1	1	403	4	17	0	4	0	44	96
Racine	0	------	0	26	0	0	0	2	0	6	11
Superior	0	------	0	1	0	1	0	0	0	4	14
Minnesota:											
Duluth	0	------	0	1	0	0	0	0	0	25	19
Minneapolis	0	------	0	9	2	7	0	2	1	7	98
St. Paul	0	------	0	1	1	3	0	2	0	25	70

[1] Figures for Concord, Barre, Tampa, and Spokane estimated; reports not received.

City reports for week ended June 21, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	1	------	------	4	------	0	0	------	0	0	------
Davenport	0	------	------	1	------	0	0	------	1	0	------
Des Moines	0	------	------	3	------	2	0	------	0	2	40
Sioux City	0	------	------	1	------	0	0	------	0	3	------
Waterloo	0	------	------	19	------	1	0	------	0	6	------
Missouri:											
Kansas City	0	------	1	62	4	3	0	1	0	7	80
St. Joseph	0	------	0	5	3	0	0	0	0	1	23
St. Louis	0	------	0	103	4	27	0	3	1	42	164
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	9	12
Minot	0	------	0	2	0	0	0	0	0	4	5
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	0	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	6
Nebraska:											
Lincoln	0	------	------	0	------	3	0	------	0	4	------
Omaha	1	------	0	0	2	2	0	2	0	0	63
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	5	2
Topeka	0	------	0	17	2	0	0	0	0	43	11
Wichita	0	------	0	1	1	3	0	0	0	4	17
Delaware:											
Wilmington	0	------	0	8	0	8	0	1	0	0	27
Maryland:											
Baltimore	2	4	3	240	10	17	0	12	0	68	196
Cumberland	0	------	0	7	0	0	0	0	0	4	12
Frederick	0	------	0	1	0	0	0	0	0	1	------
Dist. of Col.:											
Washington	1	1	1	111	2	6	0	11	0	10	162
Virginia:											
Lynchburg	0	------	0	23	0	0	0	0	0	3	9
Norfolk	0	------	0	7	2	0	0	1	1	5	27
Richmond	0	------	0	45	1	1	0	1	0	0	48
Roanoke	0	------	0	2	0	1	0	0	0	0	15
West Virginia:											
Charleston	0	------	0	0	0	0	0	0	0	4	10
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	26	0	0	0	0	0	3	16
North Carolina:											
Gastonia	0	------	0	6	2	0	0	0	0	0	6
Raleigh	0	------	0	9	0	0	0	0	0	13	7
Wilmington	0	------	0	12	1	0	0	0	0	23	7
Winston-Salem	0	1	1	12	0	0	0	2	0	2	18
South Carolina:											
Charleston	0	------	0	1	1	0	0	3	0	3	24
Florence	0	30	0	35	1	0	0	0	0	32	11
Greenville	0	------	0	1	0	1	0	0	0	0	12
Georgia:											
Atlanta	0	------	0	18	2	2	0	2	0	2	87
Brunswick	0	------	0	1	1	0	0	0	0	0	6
Savannah	0	------	0	7	1	2	0	0	1	2	33
Florida:											
Miami	0	1	1	3	0	1	0	2	0	6	36
St. Petersburg	0	------	0	4	0	0	0	1	0	0	15
Tampa	------	------	------	------	------	------	------	------	------	------	------
Kentucky:											
Ashland	1	------	0	0	0	0	0	1	1	0	8
Covington	0	------	0	1	1	0	0	1	0	1	14
Lexington	0	------	0	1	0	0	0	0	0	6	12
Louisville	0	------	0	182	0	14	0	3	0	5	72
Tennessee:											
Knoxville	0	------	0	13	2	0	0	1	0	4	23
Memphis	0	3	1	45	0	0	2	7	0	27	88
Nashville	0	------	0	13	2	2	0	4	0	0	43
Alabama:											
Birmingham	0	------	0	9	4	1	0	3	1	0	60
Mobile	0	------	0	1	0	0	0	1	0	0	13
Montgomery	0	------	------	1	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	1	------	0	0	------	1	0	------
Little Rock	0	------	0	8	5	0	0	0	0	3	37
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	0	4
New Orleans	0	1	1	2	3	1	0	18	1	15	125
Shreveport	0	------	0	0	3	1	0	0	0	1	31

City reports for week ended June 21, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Oklahoma:											
Oklahoma City	2	4	0	14	1	0	0	1	0	0	47
Tulsa	0	------	0	13	0	0	0	0	0	2	9
Texas:											
Dallas	1	------	0	11	0	2	0	3	0	1	63
Fort Worth	0	------	0	7	0	1	0	1	0	2	42
Galveston	0	------	0	1	4	2	0	1	0	0	18
Houston	0	2	0	5	5	1	0	5	0	1	83
San Antonio	0	------	0	0	4	0	0	9	0	7	82
Montana:											
Billings	0	------	0	1	0	1	0	0	0	0	4
Great Falls	0	------	0	2	1	2	0	0	0	0	3
Helena	0	------	0	1	0	0	0	0	0	0	8
Missoula	0	------	0	0	1	0	0	0	0	0	12
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	2	7
Colorado:											
Colorado Springs	0	------	0	0	0	0	0	0	0	5	16
Denver	6	------	0	72	1	3	0	2	0	100	70
Pueblo	1	------	0	2	0	0	0	0	0	14	7
New Mexico:											
Albuquerque	0	------	0	0	1	1	0	2	0	0	10
Arizona:											
Phoenix	0	23	--------	1	-------	2	0	-------	0	25	--------
Utah:											
Salt Lake City	0	------	0	8	2	1	0	0	0	14	27
Washington:											
Seattle	0	------	0	0	6	4	0	6	0	15	95
Spokane	------	------	------	------	------	------	------	------	------	------	------
Tacoma	0	------	0	1	1	0	0	0	0	11	24
Oregon:											
Portland	1	1	0	1	2	1	0	3	0	0	74
Salem	0	------	--------	1	-------	0	0	-------	0	0	--------
California:											
Los Angeles	2	5	3	42	4	30	0	17	1	88	342
Sacramento	0	------	0	4	1	3	0	2	0	8	35
San Francisco	0	2	1	0	1	4	0	4	1	32	146

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	1	0	0
Rhode Island:			
Providence	1	0	0
Connecticut:			
New Haven	0	0	1
New York:			
New York	3	1	0
Pennsylvania:			
Pittsburgh	0	0	1
Illinois:			
Chicago	1	0	2
Minnesota:			
St. Paul	0	0	1
Missouri:			
Kansas City	1	0	0
Maryland:			
Baltimore	1	0	0
Cumberland	1	0	0

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
District of Columbia:			
Washington	1	0	0
Georgia:			
Atlanta	0	0	2
Alabama:			
Birmingham	0	0	1
Texas:			
Fort Worth	0	0	1
Arizona:			
Phoenix	0	0	1
Oregon:			
Salem	1	0	0
California:			
Los Angeles	0	0	1
San Francisco	1	0	1

Encephalitis, epidemic or lethargic.—Cases: San Antonio, 1; Albuquerque, 1. Deaths: New York, 3; Trenton, 1.

Pellagra.—Cases: Boston, 1; Charleston, S. C., 1; Florence, 1; Savannah, 3; Memphis, 1.

Typhus fever.—Cases: Miami, 3; Houston, 1. Deaths: Miami, 1.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—Rats proved positive for plague have been found in Paauhau Area of Hamakua District, Island of Hawaii, T. H., as follows: Kalopa Camp—May 26, 2 rats; May 29, 1 rat; Kalopa Homesteads—June 4, 1 rat; June 6, 1 rat; June 9, 2 rats; June 10, 1 rat; Paauhau—May 31, 1 rat; Paauhau Mill (vicinity of)—June 4, 1 rat.

Plague-infected fleas.—Fleas proved positive for plague by inoculation have been reported in Paauhau Area, Hamakua District, Island of Hawaii, T. H., as follows: Paauhau—April 30, 1941, 20 fleas from 29 rats; Kalopa—May 19, 1941, 21 fleas from 11 rats; May 24, 23 fleas from 26 rats; May 31, 61 fleas from 23 rats.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 7, 1941.—During the week ended June 7, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		4	4	3	10			1	2	24
Chickenpox		20		156	292	79	57	47	58	709
Diphtheria		7	1	13	3	2				26
Influenza		3			5					8
Measles		33	49	495	1,245	84	34	36	154	2,130
Mumps	1	1	2	286	195	26	16	13	15	555
Pneumonia					12				7	19
Poliomyelitis									1	1
Scarlet fever		10	5	114	148	13	5	11	18	324
Tuberculosis		4	5	100	33	1		1		144
Typhoid and paratyphoid fever			2	9	4				1	16
Whooping cough				110	139		4	9	17	279

DENMARK

Notifiable diseases—January–March 1941.—During the months of January, February, and March 1941, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	January	February	March	Disease	January	February	March
Cerebrospinal meningitis	9	18	41	Paratyphoid fever	6	3	2
Diphtheria	38	37	35	Poliomyelitis	1	4	1
Dysentery	29	104	53	Scarlet fever	585	451	427
Epidemic encephalitis	2	1	3	Syphilis	42	34	33
Influenza	11,805	30,262	54,380	Typhoid fever	4	1	1
Measles	4,754	3,466	2,900	Whooping cough	2,653	2,022	2,141

FINLAND

Communicable diseases—April 1941.—During the month of April 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	214	Poliomyelitis	10
Influenza	2,898	Scarlet fever	350
Lethargic encephalitis	1	Typhoid fever	56
Paratyphoid fever	164		

JAMAICA

Communicable diseases—4 weeks ended June 7, 1941.—During the 4 weeks ended June 7, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox		10	Puerperal fever		4
Diphtheria	2	1	Scarlet fever	1	2
Dysentery		1	Tuberculosis	28	76
Erysipelas	1		Typhoid fever	6	41
Leprosy		2			

VENEZUELA

Poliomyelitis.—During the period November 1, 1940, to March 15, 1941, a total of 166 cases of poliomyelitis with 20 deaths occurred in Venezuela, of which 122 cases with 15 deaths were reported in Caracas.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of June 27, 1941, pages 1347-1349. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

China—Foochow.—During the week ended May 10, 1941, several cases of human plague were reported in Foochow, China. Rodent plague was also reported in Foochow during the same period.

Morocco—Casablanca.—A report dated June 23, 1941, stated that there had been an outbreak of bubonic plague at Casablanca, Morocco, where several deaths had occurred.

Peru.—During the month of April 1941, plague has been reported in Peru by Departments as follows: Ancash, 1 case; Lima, 1 case; Piura, 2 cases. Plague infection in rodents was also reported during the month in Lambayeque Department. During the month of May 1941, 4 cases of plague with 2 deaths were reported in the port of Ilo, Department of Moquegua, Peru.

Typhus Fever

Gibraltar.—During the week ended May 10, 1941, 2 cases of typhus fever were reported in Gibraltar.

Yellow Fever

Colombia.—During the month of March 1941, yellow fever was reported in Colombia as follows: Antioquia Department, 1 case, 1 death; Boyaca Department, 1 case, 1 death.

×

Public Health Reports

VOLUME 56 JULY 18, 1941 NUMBER 29

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE * 1798 *

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

// Public Health Reports

Vol. 56 • JULY 18, 1941 • *No. 29*

A PROGRAM FOR CIVILIAN MENTAL HEALTH[1]

By WATSON B. MILLER, *Assistant Federal Security Administrator, Washington, D. C.*

Twenty years ago it would have been impossible if not fantastic for a layman like myself to come before an audience such as this and suggest the means for dealing with a grave, an immediate medical emergency affecting every one of America's millions.

But America's millions are interested too. They are interested as citizens and taxpayers. In accidents, death, destruction, broken homes, and disorganized lives, they have seen the results of mental disease.

What must be done, how it shall be done, are your problems. But public policy demands that it *shall* be done.

These things lie very close to the heart of the work of the Federal Security Agency. They are fundamental in education. They are fundamental factors in planning social security for the aged and the needy. They are part of the everyday business of the United States Public Health Service and Saint Elizabeths Hospital.

The poets, the playwrights, the novelists—laymen, if you will—were the first students of man as man. For centuries they applied instinctive insight to the interpretation of man's behavior. In modern years, the poet has had psychiatry's explicit understanding with which to illumine intuition. And so it seems especially fitting that I, as a layman, should express the hope and the challenge of psychiatry in the words of a modern poet, Robert E. Sherwood, in his play "There Shall Be No Night." The central character of that play, a Finnish psychiatrist, says:

> You have heard it said that the days of exploration are over—that there are no more lost continents—no more Eldorados. But I promise you that the greatest of all adventures in exploration is still before us—the exploration of man himself—his mind—his spirit—the thing we call his character—the quality which has raised him above the beasts. "Know thyself," said the oracle. And after thousands of

[1] Delivered at a symposium on "The Psychiatrist and the National Emergency" sponsored by the Surgeons General of the Army and the Navy, the Director of the Selective Service System, the Director of the U. S. Veterans' Administration, the Administrator of the Federal Security Agency, and the American Psychiatric Association Committee on Military Mobilization, Richmond, Virginia, May 4, 1941.

years, we still don't know. Can we learn before it is too late—before the process of man's degeneration has been completed and he is again a witless ape, groping his way back into the jungle?

Our democracy has reason to believe that in knowledge is strength. Our very hope for a world worth fighting for, worth living in, lies in our understanding of man's intrinsic worth. And that understanding is measured in ever-increasing degree by the rich promises of continued advances in psychiatry.

The hope gives us courage, but the challenge is sharp, ominous. "Can we learn before it is too late?" More urgently, can we apply what we *do* know before it is too late?

Psychiatry today has a sufficient body of knowledge to detect incipient and frank mental disease, to apply rational treatment not only to acute and chronic disorders but even to their early manifestations. But I believe that today we can envision for psychiatry an even more significant role than the discovery and alleviation of mental disease. Psychiatric knowledge when applied can help human beings to a better understanding of their own problems and the relation of their own behavior to that of other people. We have need to do this, for the war now engulfing the world is far more a war of the spirit than a war of body against body. Can we build in human beings stronger bulwarks of emotional defense against the onslaughts of a world crisis more grave than any recorded in history?

We have already asked so much in the way of adjustment on the part of human beings. We ask parents to adjust their lives for the sake of the children; we ask the youth of the Nation to adjust themselves to our machine civilization. The worker is expected to adjust himself to his place in the industrial scheme, the employer, to the economic needs of our society. Our old people are asked to adjust themselves to advancing age and retirement from their former status of family and social authority. And now millions of young men are expected to adjust themselves to the tensions of military service, an environment totally different from their usual way of life.

Society's "great expectations" for an extremely high spiritual performance by mankind cover virtually the entire population, civilian as well as military. I think we should all consider our chances for realizing our expectations, the means at hand to attain the objective, and the tools we need to do the job.

What then is our emergency problem in relation to mental health?

I feel an intellectual embarrassment akin to that of the man who brought coals to Newcastle when I present this audience with the fact that there are some 750,000 patients with mental and nervous diseases in American institutions whose care costs the United States in the neighborhood of $250,000,000.

I mention it with some hesitancy for this reason. True, we owe

a debt of gratitude to the statisticians and economists for defining the current magnitude of one sector of the mental disease problem. But as a responsible citizen who, with my contemporaries, must help you, the experts, solve this problem, I find myself bogging down in the face of such a discouraging statement, especially when it is coupled with the thought that mental disease is on the increase. The danger is that we exclaim, "Isn't this appalling!", and let it go at that.

It is much easier to push large, impersonal figures into the back of the mind than to face the poignant experience of a man in the prime of life, suddenly stricken with an acute mental illness, removed from his home by the local police in the patrol wagon to a county jail, incarcerated there until a bed becomes available in the large, overcrowded, understaffed State hospital. You know far better than I what his chances are for speedy, satisfying recovery, under such conditions.

The load of mental disease today is very large; the chronicity of a very large proportion of cases makes the burden excessively heavy in terms of economic loss and cost. But the magnitude of the problem should not, must not, blind us to our own poor performance in lightening the burden. I say "must not" for if the current picture is discouraging, the outlook for the future is even more threatening.

We in this country have not felt the incalculable strains resulting from actual conflict. But we have already begun to experience the strains of "psychological" war and of the disruptions incident to our preparedness efforts. Competent experts are here today to discuss with you the effects of the emergency upon the industrial worker, the soldier, and their families. I need scarcely tell you that the well-being of these groups is the very life-blood of national safety.

An eminent bacteriologist once told me that when an external enemy threatens a colony of bacteria, the great mass of individuals group in such a way as to increase the efficiency of the "fighters," the members of the colony who go out and attempt to deal with the enemy. For group survival, we must accept just this same clear responsibility, and *now*.

Industrial and military efficiency are immediate, urgent requirements for the survival of democracy. And we have come to accept the fact that efficiency functions not in the performance of machines, but in the performance of human beings. Their performance, in turn, depends upon that indivisible whole—emotional and physical status. Thus, if we are to survive, we must first of all follow the example of the lower organisms and group together to increase the efficiency of those who will, either in industry or the armed forces, actively defend our civilization.

Action has already been taken by the several Government agencies and by cooperating organizations such as the American Psychiatric

Association to insure the recruitment and induction into the armed forces of men emotionally as well as physically fitted to withstand the strenuous demands of military service.

The fate of those who are rejected because of incipient mental disease, obvious psychoses, mental defect, or even emotional instability, is very definitely a civilian mental health problem. Are we to write them off as so much waste material? Can we afford to do so when we know that we shall need, somewhere in our defense effort, every man and woman who can contribute anything at all?

A great many such persons can, without any special treatment, make a very valuable contribution in work best suited to their individual abilities. But we do not yet know what the effect of a rejection because of psychic defect has upon the rejected individual. It can be a very damaging experience. Whether it is or not depends almost entirely upon the way the situation is dealt with in the civilian community Again, another group of rejected individuals can, with some expert assistance, make a more satisfactory adjustment to civilian life than they have hitherto. We need this kind of improvement—salvage, if you please. In short, I am thinking of our present program for sifting out the fit for service in the armed forces as a case-finding mechanism for the improvement of civilian mental health.

I wish that I could say that definite plans have been formulated for the detection of mental disorder in the employment of industrial personnel. Although the requirements for efficient performance in the complexity of industrial production may not be so rigid as in the selection of military personnel, it is safe to say that a large proportion of the personnel problems in industry could be prevented by a wider application of psychiatric concepts to the employment and placement of workers. Many of the large industrial concerns have taken this important step, and have found it valuable not only in promoting efficiency but even in economic savings. The same may be said of psychiatric services maintained in many companies for the detection and amelioration of mental disorders occurring on the job.

Despite these constructive programs, the fact must be emphasized that more than 60 percent of all industrial workers in the United States are employed in small plants, with 500 workers or less, most of which have no industrial hygiene program and no medical service, let alone programs for mental health. An aggressive industrial hygiene program in the defense industries has been put in motion and is proceeding with all the speed that limited resources and lack of trained personnel will permit. That program, as you will hear later on, very definitely includes consideration of the mental health problem. Nevertheless, I am convinced that its solution will require the active participation of all the resources available for civilian defense.

Let me be more specific. How many times could the improvement of a difficult home situation solve the problem of one worker whose emotional difficulties not only hamper his efficiency, but also that of a large number of his associates? Inadequate housing, insufficient income to provide adequate diet for his family, dependent aged relatives, catastrophic illness, even mental disease in the family—these are common situations definitely affecting the emotional well-being of the worker, and I may say, affecting the efficiency of the soldier in the far-off cantonment. Such situations must be met at home, in the civilian community. Thus, we can see that one facet of a program for civilian mental health is the coordination of all services that contribute to the health and welfare of the individual and focusing them upon the promotion of mental well-being.

We have further to consider the more distant future, though none of us can visualize what it holds for us in terms of increase or decrease of mental disorder. We cannot say when this present world conflict will end. We have accepted our responsibility in determining how it will end—that is, we are committed to defend and preserve here and abroad the democratic way of life. The conflict will end, but we do not know what the adjustment period will bring. I think we are all agreed that we must expect more serious social and economic dislocations than we have yet experienced. Serious thought is already being given to how we can provide "shock-absorbers" for social and economic disruption. It is equally important that all our best minds turn attention to the means of offsetting the emotional dislocations we know will result in a post-war period.

The experience of the last war stands before us, a silent but potent warning. We have no reason to believe that the readjustment of soldiers and sailors to civilian life will be easier than in the past. The United States Veterans' Administration has hospitalized no less than 358,670 cases of mental and nervous disease since 1921. No one will dispute that many of the destructive manifestations in post-war civilian life—crime, alcoholism, divorce, disregard of morals and of adult responsibility—had their roots in psychic disturbance. Our problems may well be more widespread, more malignant than they were during the twenties and thirties.

One of the first matters to be considered in planning for civilian mental health is the successful readjustment of demobilized men to civilian life. Such a program should include not only the discovery and intensive treatment of early cases of mental disease, but also guidance for men who, although not ill, are experiencing emotional difficulties in returning to family life. This task is not a light nor an easy one. The longer demobilization has to be delayed, the longer a very important group of young Americans will be exposed to the difficult environment of military service, and the more complex will be

their and the community's problems during the period of readjustment.

Our present burden of discovered and undiscovered mental illness is great, the nature and magnitude of our future task, obscure. The disastrous results of further neglect on the part of society are unimaginable. Perhaps in no other area of human endeavor does the warning "It is later than you think" apply so aptly as in our efforts for mental health.

What do we have at hand to meet the emergency? Psychiatric knowledge already far outstrips its application. Much more can be learned, and will be learned as greater attention is paid to research in nervous and mental diseases. Psychiatry in the United States is far more advanced than in any other country. We have reason to be proud of the position of world importance occupied by our research and our clinical achievements.

Yet there are in the United States today only 3,000 trained psychiatrists. Psychiatric nurses number perhaps 6,000. And for psychiatric social work and occupational therapy, two of America's unique contributions to clinical psychiatry, we have some 1,500 trained workers.

What is more disturbing, medical education has not equipped general practitioners to recognize mental disease in its early stages, nor to apply psychiatry in the treatment of a very large number of their patients whose bodily ailments are clearly psychic in origin. Yet, it is impossible to see how we can make further progress in mental hygiene without the informed interest of the general practitioner. It is he who first sees the great majority of incipient cases; it is he to whom the neurotics turn with their subjective symptoms, very real to them, for which he can find no demonstrable physical cause.

But graduate and undergraduate psychiatric training in our medical schools should be more than encouraged; it should be pushed with every resource at our command. It would be useless even to toy with the idea of attacking our civilian mental health problem if the immediate future offers no hope of a continuing, ever-increasing supply of physicians aware of the implications and opportunities in psychiatry.

Not only the major share of case-finding but even a part of treatment can be done by the well-trained general practitioner. The psychiatrist should be regarded as the consultant and the specialist in the treatment of mental disease. We do not propose to increase the scope of the psychotherapist's functions, but the supply of trained psychiatrists must be increased.

We do not have a sufficient number to do the job which confronts us at the moment. Indeed, the problems of maintaining professional staffs for the care of the mentally ill become increasingly acute with

every passing day. The draining off from mental institutions of young physicians to supply the needs of the Army and the Navy is already imposing grave hardships, not only in State, city, and county hospitals, but even in the psychiatric service of the Veterans' Administration.

Even in normal times, public mental institutions have been seriously understaffed. The most recent estimates indicate that in State mental hospitals alone the present medical staff is only 42 percent of its required strength, and the nursing staff only three-fourths of minimum standard. We need at least 1,000 more physicians and 10,000 additional nurses and attendants, this without planning for future increases in mental patients and future depletions of staff through the draft.

This brings us face to face with the present status of public care of the mentally ill. As in the study of any other social program, the national picture of mental hospitals reveals marked variations in facilities and services. As in other social programs, the variations in public care of the mentally ill cleave fairly closely to the line of State financial competence. The poor States have poor facilities and services. The wealthier States have better facilities and services.

But within these clear-marked lines, there are variations for which economic and regional considerations can offer no excuse. Some States, some regions, invest sufficient funds to maintain adequate or nearly adequate facilities. Other States simply do not accept their clear responsibility.

Our public hospitals for mental patients are notoriously overcrowded. Recent estimates indicate that mental hospitals for the Nation as a whole are overcrowded 11 percent in excess of their rated capacity. In some States overcrowding is below the national rate; but in New England and the Pacific States, the rate is from 15 to 24 percent. Even to meet present conditions, it is estimated that an additional 130,000 beds for mental patients are needed. Equally sharp variations exist in the provision of ancillary services such as dental care, occupational therapy, and psychiatric social work for the mentally ill.

With these many problems before us, how can we best plan a program for civilian mental health? I think it is obvious that we must first safeguard and improve our existing facilities for care of the mentally ill.

State legal provisions for admission to public mental hospitals should receive early attention. State laws vary from the intelligent method of commitment upon the recommendations of qualified physicians to inhumane trial by jury.

Politics should be taken out of the administration of public mental institutions. It is almost impossible to look for substantial progress

in our care for the mentally ill until some merit system is applied to the personnel employed in State, city, and county mental hospitals. With each political upheaval, the personnel of such institutions in localities where there is no civil service system are subject to dismissal. Obviously, no continuing program can be developed and pursued under such conditions.

Likewise, our public mental institutions should provide better opportunities for able young men and women on their medical and nursing staffs. Not only should job security apply, but salary scales should be established to attract and to hold competent professional personnel in our public hospitals.

I have already indicated the need for increased emphasis on psychiatric education in our medical schools. More thought must be given to recruitment for psychiatric service, especially with the threat of loss of staff to the armed forces staring us in the face.

Psychiatry has not yet tapped all the reservoirs of qualified recruits. For example, there are today 300 women psychiatrists in the United States; the success of women in this field is undisputed. There are a great many young women physicians who, with appropriate post-graduate training in psychiatry, could render highly competent service in mental hospitals. Here is a group exempt for obvious reasons from service in the Army and Navy medical corps, yet of enormous potential value in civilian service. Older men physicians, beyond the draft age, also should be considered for intensive post-graduate training in psychiatry.

The essential requirement for such training is interneship or residency or both in the very best type of mental hospital. Governmental and private institutions which fall in this category could make a significant contribution to the solution of the emergency problem by providing such interneships and residencies.

Even if we could meet, overnight, all the needs for medical personnel, we have only scratched the surface. A highly competent and sufficient staff of psychiatrists will not compensate for underlying defects in the hospital's concept of care of the mentally ill. In fact, "treatment" rests not in the hands of the physician alone but in the work of nurses, attendants, and other employees of the hospital. It rests also in the administrative program, the equipment available, and in the spiritual atmosphere of the institution.

I am wondering if we do not need, in planning for civilian mental health, to plan for the study and reconditioning of our performance in rendering care for the mentally ill. It is well enough, indeed essential, that we enumerate our lacks in facilities and personnel. Should we not also study the quality of our service?

New construction will be needed in some areas in order to bring hospital facilities up to the minimum standard. However, this does

not mean that we shall have to provide 130,000 new beds to meet existing needs.

Many general hospitals are establishing psychiatric units, where acute recoverable cases of mental disease can be given intensive treatment. This development should be encouraged in our community organization for defense. Although many areas will need new construction to provide adequate general hospital facilities, in other areas there are many general hospitals with empty beds. In line with our policy to coordinate and use all available resources, communities should draw upon these sources in meeting their mental health problems. Likewise, plans for new general hospital construction should take account of the needs of the community for treatment of mental patients.

The construction of a few beds in an appropriately equipped unit is a good investment, even though the administrator of a general hospital recognizes the relatively high cost of diverting space to mental disease cases. True, they are "fixed" beds, they can no more be used for an overflow from the accident ward than can beds in the contagious disease unit. But let it be remembered that our greatest hope of stemming the flooding tide of chronic mental disease lies in prompt, intensive treatment of patients with acute, recoverable disorders, in an environment which does not bear the stigma of a mental hospital.

Many patients with mild, chronic disorders can make a successful adjustment to life outside the hospital, after a period of treatment. The "boarding-out" system adopted by a number of public mental hospitals has proved successful not only in releasing much needed beds but also in improving the status of the patients. Further developments in this direction may well be considered in planning for civilian mental health.

Here and there in the United States, local public health departments are establishing mental hygiene units in their administration. Although in an experimental stage, we shall follow this work with great interest. The unit is headed by a psychiatrist, who works closely with public health personnel and private physicians. He has an excellent opportunity to plant psychiatric concepts in the professional approach to the community's health problems. Medical health officers, school physicians, and public health nurses gain from him valuable aid in dealing with the emotional problems of individuals whose health problems daily concern them. In his consultant capacity, the psychiatrist in a mental hygiene unit can be of great assistance to local practitioners and to other community agencies.

The joint action of the Selective Service System and the Army for the detection of mental disorder in men called for military duty imposes definite responsibilities upon local communities. Plans must

be made and put into effect for the protection of men rejected because of mental disorder or emotional instability. We are in danger of doing irreparable harm through our efforts to secure for the Army the type of man best suited to full military duty. Rejection calls for explanations; explanations lead to speculation, and the first thing you know, name calling buzzes through the community. A successfully adjusted, adequate person is pilloried, perhaps loses his job. Obviously, the civilian authorities must work out some way of handling these incidents with discretion and tact so that no individual suffers social or psychic injury.

This situation certainly points to the urgent necessity for public education—another long-overdue activity for civilian mental health. Psychiatry at best has done a meager and ineffective job in making itself known to the general public. Yet, it is well known that, in the hospital and in the psychiatrist's office, age-old superstitions, fears, and the stigma which even today attaches to the simple act of seeking help, handicap the treatment of patients. Indeed, in some of our public hospitals, valuable members of the staff spend their entire time talking to families and friends, trying to teach the whys and wherefores of mental disease, its cause, its course, and its cure.

It is my feeling that the psychiatric profession and all other organizations that can contribute anything to education of the public in this field must do so now. It is all very well to talk of directing a frontal attack upon mental disease in its early stages and its acute or chronic manifestations. But we cannot do this with any significant effect and reasonable economy unless we bring the public along with us.

I venture to predict a new concept of preventive psychiatry. In so many diseases of great public importance, our only means of prevention is early diagnosis and prompt treatment. This is true of tuberculosis, venereal diseases, and pneumonia; it is true if we wish to control cancer. There are no shots in the arm to prevent these ailments; and there is no shot in the arm for mental disease. Nevertheless, through continued research, through education of the professions and the public, and through well-planned programs, we are moving toward the final conquest of tuberculosis and venereal disease; we are driving down the death rate from pneumonia to a hitherto undreamed of level. The techniques of diagnosis and treatment of mental disease are not so specific, so precise as in other conditions that prey upon our national strength. But the principle is the same. A program for civilian mental health should be founded upon the same concept—early diagnosis and prompt treatment. The fact that both case-finding and treatment will draw upon all our educational, social, economic, and medical facilities only enhances the opportunity for strengthening the morale of the American people in this urgent hour and in the critical years ahead.

STUDIES IN CHILDBIRTH MORTALITY[1]

III. PUERPERAL FATALITY IN RELATION TO MOTHER'S PREVIOUS INFANT LOSSES

By JACOB YERUSHALMY, *Statistician, United States Public Health Service*, ELIZABETH M. GARDINER, *Director, Division of Maternity, Infancy and Child Hygiene, New York State Department of Health*, and CARROLL E. PALMER, *Passed Assistant Surgeon, United States Public Health Service.*

The underlying conditions leading to the death in childbirth of a mother or an infant may be associated either directly with the puerperal state or may have their origin in causes far removed from the immediate pregnancy. For example, the death of a mother or of an infant resulting from malposition of the fetus may be related only to the present pregnancy, while the death in childbirth of a woman suffering from a chronic heart ailment may be the final outcome of a condition of many years' duration. For effective control and prevention of the casualties of childbirth, it is therefore not sufficient to seek improvements in obstetrical techniques and adequate prenatal and postnatal care but it becomes important to consider also the much broader aspects of public health and clinical medicine.

There is no sharp line of demarcation between the causes directly associated with the puerperal state and those of more remote origin. Probably no cause of maternal and infant death is entirely independent of the general well-being of the mother and of her previous medical and reproductive history. A more precise knowledge of this relationship may lead to a better understanding of the causal pattern of maternal and infant mortality and thus furnish the necessary background for more effective control.

The number of previous deliveries (parity) is closely related to the outcome of both mother and infant in a subsequent pregnancy. For women of the same age the rate of loss of both mother and infant increases with parity (the only exception being first births) (*3*, *4*). In the case of infant loss in the form of stillbirths and neonatal deaths, the rate depends not only on the number of previous births to the mother, but also on the survival of the previous births. In other words, it was shown (*1*) that there is a familial tendency to stillbirths and neonatal deaths; the stillbirth and neonatal mortality rates of infants born to mothers who had had previously one or more infant losses are more than twice as high as those of infants born in families in which the previous issue all survived.

In many instances the underlying conditions which lead to the loss of mother are also related to the death of the offspring. Thus the rate of loss of infants whose mothers died from a puerperal cause during

[1] From the Division of Public Health Methods, National Institute of Health, U. S. Public Health Service, and the Division of Maternity, Infancy, and Child Hygiene, New York State Department of Health.

their birth is very much higher than that of infants whose mothers survived the postnatal period. Similarly, the puerperal fatality of mothers whose infants were either stillborn or died neonatally is considerably greater than that of mothers whose infants survived the first month of life (*2*). For a better understanding of the factors relating to childbirth mortality it is, therefore, desirable to investigate the mortality of the mother in conjunction with that of the offspring. Such studies will bring out not only the similarities but also the differences between the reactions of the mother and of the infant to the factors under investigation.

The object of the present paper is to investigate the mortality of the mother and of her offspring in relation to the survival of the previous issue to the mother. In general terms the problem under investigation may be stated as follows: When mothers of the same age and parity are separated into different categories, one consisting of mothers whose previous children have all survived, and the others comprising mothers who have lost one or more of their previous children, will the mortality experience of mother and infant in a subsequent delivery differ in these categories? As was stated above, the part of this problem which relates to the infant has been considered in a previous study (*1*), so that the main purpose of this investigation is to determine whether a similar relationship exists for puerperal fatality. However, the results concerning the infant are also presented, not only for the purpose of confirming the previous results (since the present study is based on three times as many births as the previous one), but mainly for the purpose of contrasting the mortality of mothers with that of their infants.

MATERIAL AND METHOD

A more detailed description of the material on which this study is based was given in the first paper of this series (*2*) and only a brief account will be given here. The studies are based on records of over a quarter of a million deliveries occurring in New York State (exclusive of New York City) in the 3-year period 1936–38. The data were derived from birth and death certificates received by the New York State Department of Health. The names of all women who died from a puerperal cause were searched in the index of births to determine whether a live birth or stillbirth certificate was registered. Searches were also made in order to match the birth and death certificates of all infants who died under 1 month of age. The information from each of the matched certificates was brought together on a single punch card.

Women whose deaths were associated with abortion, miscarriage, ectopic pregnancy, and those who died undelivered were excluded, since no birth certificate is filed for these conditions. There remain

only the deaths of mothers delivered of an offspring of viable age.[2] The risk of death to the mother which is associated with such delivery was defined as "puerperal fatality." This risk was measured by a "puerperal fatality rate" defined as the number of deaths of mothers who were delivered either of a live birth or of a stillbirth per 10,000 total deliveries (including those of stillbirths).

During the 3-year period 1936–38, 255,727 women were delivered of 258,525 infants.[3] Of these infants, 7,177 were stillborn and 7,550 died neonatally (under 1 month of age). During the same period 1,122 deaths of women were registered in which the primary cause of death was classified as puerperal. A thorough search in the vital statistics files produced birth and stillbirth certificates for 689 deliveries of these 1,122 puerperal deaths. From the statements on the women's death certificates, it was possible to establish with reasonable accuracy that for the remaining 433 women pregnancy terminated either in an abortion or a miscarriage, or that it was ectopic, or that the woman died in the pregnant state undelivered.

Since this study deals with the previous obstetrical history of the mother, all first births have been excluded. The basic material in this investigation includes the 161,177 births of orders 2 and over and the 411 puerperal deaths which occurred in this group.

The survival of previous births to the mother up to the time of the last delivery was determined from the statement on the birth certificate. The question on the certificate which yielded the required data reads as follows: "Number of children of this mother (at time of this birth and including this child) (a) Born alive and now living . . . (b) Born alive but now dead . . . (c) Stillborn . . ."

TEST OF ADEQUACY OF THE MATERIAL

In testing the reliability of the material it is, obviously, not proposed to establish that every single certificate is exact and accurate. In fact every one who has had occasion to work with birth and death certificates knows that occasional certificates may be grossly inaccurate. However, the information derived from the entire group of certificates may, nevertheless, be adequate if it is possible to establish, first, that the total error introduced in the entire aggregate of certificates is not large, and second, that the inaccuracies which have been recorded on individual certificates are not selective for the problem under investigation. Several tests of this nature have been made in the previous paper on familial susceptibility to stillbirths and neonatal deaths (*1*). The tests concern the rates of previous infant losses according to various factors. These rates were found to conform to

[2] The term "an offspring of viable age" is used to denote a fetus which advanced at least to the fifth month of utero-gestation and which was registered either as a live birth or as a still birth

[3] There were 2,754 pairs of twins and 22 sets of triplets.

known facts. The tests will be repeated here for the births of the 3-year period 1936–38 (in the previous paper only the 1936 births were used). In addition, the rates of previous infant loss for 1936–38 are compared to those of 1936 to furnish further evidence of the reliability of the material on which this study is based.

From data in table 1, it is possible to determine the rate of loss (exclusive of abortions and miscarriages) sustained in the previous issue of the mothers whose records are included in this study. The mothers of the 161,177 births had had previously a total of 439,140 births. Of these, 52,801 were either stillborn or died before the last birth, the rate of loss being 120.2 per 1,000 total previous births. This loss was made up, for the most part, of stillbirths and deaths of infants under 1 year of age, and, to a lesser degree, of deaths of children over 1 year of age. The rate of stillbirths and infant mortality combined in the last decade in the area considered was around 90 per 1,000 total births. Hence the rate of 120.2 for the combined loss, including children over 1 year of age, is approximately the value to be expected.

TABLE 1.—*Live births and stillbirths (exclusive of first births) by order of birth according to the number of children lost to the mother prior to the last birth, New York State (exclusive of New York City), 1936–38*

Order of birth	Total births	Number of children lost to the mother prior to the last birth										
		0	1	2	3	4	5	6	7	8	9	10 and over
2	63,878	58,326	5,552									
3	35,735	29,082	5,946	707								
4	21,343	15,642	4,631	950	120							
5	13,157	8,699	3,334	903	184	37						
6	8,756	4,973	2,538	869	297	57	22					
7	6,088	3,067	1,891	755	260	80	25	10				
8	4,208	1,873	1,285	622	252	126	35	12	1			
9	2,702	1,026	841	471	228	83	31	14	5	3		
10 and over	5,310	1,318	1,398	1,118	637	402	187	126	62	35	14	13
Total	161,177	124,008	27,416	6,395	1,978	785	300	162	68	38	14	13

Additional confidence in the material is gained from the fact that the rate of previous loss for the mothers of the 1936 births was higher (124.5) than that for mothers of 1936–38 births (120.2). This higher rate is to be expected because of the downward trend in childhood mortality, particularly in infant mortality. The previous children of the mothers of the 1936 births were exposed, on the whole, to higher mortality rates than the previous children of the mothers of the 1936–38 births.

Table 1 affords another check on the reliability of the material. From the fact that infant mortality has been declining during the last decade, in addition to the obvious fact that the previous children of the mothers of the higher orders of birth were exposed to the risk of

death for a longer period of time than those in the lower orders of birth, it follows that the rate of previous loss should increase continuously with order of birth. It is also to be expected that in each order of birth the rate of loss among the previous children of the mothers of the 1936–38 births should be lower than the rate for the children of the mothers of the 1936 births. The following rates show that such was the case:

Order of birth	Rates of loss of previous children per 1,000 total previous births	
	Children of mothers of 1936–38 births	Children of mothers of 1936 births
2	86.9	89.2
3	103 0	103.8
4	107.6	108.7
5	111 0	114.9
6	125 7	129.2
7	128 3	129.6
8	137.3	148.2
9	143 3	144.3
10 and over	176.3	182.4

One other test of the material concerns the relationship of infant mortality to age of mother. It is known that for every order of birth, the stillbirth as well as the neonatal mortality rates start high when the mother is young, drop to a minimum, and then rise with age of mother (*4*). The rate of loss among the siblings of the second births according to age of mother at the time of the second birth should therefore also follow the same pattern. Here also it is to be expected that the rates among the previous children of the mothers of the 1936–38 births should be lower than those of the children of the mothers of the 1936 births in the various age groups of mother. The following rates show that such was the case:

Age of mother	Rates of loss of previous children per 1,000 total previous births	
	Children of mothers of 1936–38 births	Children of mothers of 1936 births
Under 20	120.8	124.0
20–24	86.6	88.0
25–29	79.2	80.4
30–34	85.1	89.8
35–39	96.7	102.3
40 and over	130.4	119.8

From the above considerations it appears, first, that the rates of loss of the previous issue to the mothers entering in this investigation are of the order of magnitude which is compatible with the prevailing rates in the period. It is thus shown that on the whole the physician's

record of the previous obstetrical history of the mother on the birth certificate is substantially reliable. It is also shown that the variation of the rates of previous loss according to the factors of order of birth and age of mother conform to known facts. These considerations indicate that such errors as may have been entered on individual certificates are not selective for the problem under investigation.

GENERAL RESULTS

Of the 161,177 births of orders 2 and over entering into this study, 4,184 were stillbirths and of the remaining 156,993 live births 4,645 were neonatal deaths (deaths under 1 month of age). The stillbirth rate of this group was 26.0 per 1,000 total births (including stillbirths) and the neonatal mortality rate was 29.6 per 1,000 live births, or a combined loss (late fetal and neonatal mortality rate) of 54.8 per 1,000 total births. There were 411 puerperal deaths among the mothers of these births. The puerperal fatality rate was 25.5 per 10,000 total births.[4]

An indication of the association between previous losses and the rate of loss of mother and infant in the current delivery may be obtained indirectly from the fact that the siblings of the 152,348 infants who survived the neonatal period suffered a rate of loss of 110.5 per 1,000 total previous births, while the siblings of the 8,829 infants who were either stillbirths or neonatal deaths suffered a rate of loss of 230.7, and the rate of loss of the previous children of the 411 mothers who died in childbirth was 157.3. The association implied by these figures will be investigated more directly. For this purpose, the mothers entering into the study are divided into various groups according to the survival of their previous issue. All mothers who have previously lost 1 child will be considered in one group denoted by L_1. Every mother falls in one of the groups L_0, L_1, L_2, L_3, etc., denoting mothers who have lost respectively none, one, two, three, etc., of their previous children. L_{1+} will denote the group of mothers who have lost 1 or more of their previous children.

Of the 161,177 births of this study, 124,008 fell in the group L_0 and 37,169 fell in the group L_{1+}. Thus 76.9 percent of all the births of orders 2 and over were to mothers who had lost none of their previous children, and 23.1 percent were to mothers who had lost 1 or more previous children. In the first group (L_0) there were 2,401 stillbirths, 2,561 neonatal deaths, and 260 puerperal deaths. The corresponding numbers in the group with one or more previous losses (L_{1+}) were 1,783, 2,084, and 151, respectively. The respective rates in the

[4] The "puerperal fatality rate" was defined in the previous papers of this series as the number of deaths of mothers who were delivered either of a live birth or of a stillbirth per 10,000 total deliveries (not births). However, since the rates for infant loss are based on births, it was found desirable for the purpose of this study to base also the puerperal fatality rates on births rather than on deliveries. The error introduced by this procedure is slight since multiple births form only about 1 percent of total births.

groups L_0 and L_{1+} were 19.4 and 48.0 for stillbirth, 21.1 and 58.9 for neonatal mortality, and 20.9 and 40.6 for puerperal fatality. Thus the rates of loss of both mother and infant were about twice as high in the group with a history of previous loss as in the group with no previous losses.

Causes of death.—The puerperal fatality rate was higher for group L_{1+} than for the group L_0 in each of the causes of death. Table 2 presents for the two groups L_0 and L_{1+} the distribution of the maternal deaths by cause of death (according to the classification of the 1929 revision of the International List and the Manual of Joint Causes of Death). In addition the table presents the puerperal fatality rates specific for the various causes per 100,000 births as well as the percentage distribution by cause. From the rates and the percentage distribution in the table it appears that while the increase in the group L_{1+} was present in all causes, the relative increase was greater for some causes than for others. Consequently the percentage distribution of the deaths is somewhat different in the groups L_{1+} and L_0. For example, a considerably larger proportion of the deaths in the group L_{1+} was due to accidents of pregnancy (International List No. 141) and to abortion [5] with septic condition (International List No. 140).

TABLE 2.—*Distribution of puerperal deaths by cause of death according to the survival of mother's previous children, second births and over, New York State (exclusive of New York City), 1936–38*

Previous losses	Total (all causes)	Primary cause of death: Abortion with septic conditions [1] (140)[2]	Abortion without mention of septic conditions [1] (141)	Hemorrhage (144)	Puerperal septicemia (145)	Toxemia (146-7)	Accidents of childbirth (149)	Embolism and thrombosis (148)	All other (150)
	Number of puerperal deaths								
None (L_0)	260	3	16	68	47	51	53	20	2
One or more (L_{1+})	151	7	15	30	24	33	31	11	------
Total	411	10	31	98	71	84	84	31	2
	Puerperal fatality rates per 100,000 births								
None (L_0)	209.7	2.4	12.9	54.8	37.9	41.1	42.7	16.1	1.6
One or more (L_{1+})	406.3	18.8	40.4	80.7	64.6	88.8	83.4	29.6	------
Total	255.0	6.2	19.2	60.8	44.1	52.1	52.1	19.2	1.2
	Percentage distribution of puerperal deaths								
None (L_0)	100.0	1.2	6.1	26.2	18.1	19.6	20.4	7.7	.8
One or more (L_{1+})	100.0	4.6	9.9	19.9	15.9	21.9	20.5	7.3	------
Total	100.0	2.4	7.5	23.8	17.3	20.4	20.4	7.5	.5

[1] The title "abortion" is, in a sense, misleading since under this classification are coded also deaths of mothers of viable offspring when the cause of death is an accident of pregnancy.
[2] Figures in parentheses are International List numbers.

[5] See footnote to table 2.

Correspondingly a smaller proportion of the deaths in L_{1+} was due to hemorrhages (other than placenta praevia) and to puerperal septicemia.

Number of previous losses.—The rate of loss of both mother and infant was directly related to the number of previous losses. The distribution of the births according to the number of previous losses was as follows:

Number of previous losses	Number of total births	Percent of total births
0	124,008	76 9
1	27,416	17.0
2	6,395	4.0
3 and over	3,358	2.1
Total	161,177	100.0

The distribution of the stillbirths, neonatal deaths, and puerperal deaths according to the number of previous losses and the respective rates is shown in table 3 and figure 1. It will be noted that the higher the number of previous losses to the mother, the greater was the chance of death to both mother and infant. The increase with advancing number of previous losses was more pronounced for the loss of offspring than it was for the loss of mother.

TABLE 3.—*Neonatal mortality and puerperal fatality rates according to the number of previous losses to the mother, second births and over, New York State (exclusive of New York City), 1936–38*

Previous losses	Live births	Still-births	Neonatal deaths	Puerperal deaths	Rates		
					Still-birth [1]	Neonatal mortality [2]	Puerperal fatality [3]
0	121,607	2,401	2,561	260	19 4	21.1	20.9
1	26,301	1,115	1,334	100	40.7	50.7	36 5
2	6,020	375	446	33	58.6	74.1	51.6
3 and over	3,065	293	304	18	87.3	99 2	53.6
Total	156,993	4,184	4,645	411	26.0	29.6	25.5

[1] Stillbirth rates per 1,000 total births (live births and stillbirths).
[2] Neonatal mortality rates per 1,000 live births.
[3] Puerperal fatality rates per 10,000 total births.

ORDER OF BIRTH AND AGE OF MOTHER

The rates of loss of both mother and infant are known to depend on parity and age of mother, the rates being generally higher for the higher orders of birth and for the older mothers. It is, of course, also obvious that the chances of having had a previous loss increase with parity. For example, the mothers in the group L_0 had had an average of 2.24 previous children, while the mothers in the group L_{1+} had had an average of 4.35 previous children. It is therefore possible that the higher rates found in the group L_{1+} over those of L_0 may be a consequence of the difference in parity in the two groups. In order

to determine whether the higher rates associated with previous losses are independent of parity it becomes necessary to compare the rates of L_{1+} and those of L_0 in each order of birth. This is accomplished in table 4 and figure 2, which present the distribution of the live births, stillbirths, neonatal deaths, and puerperal deaths by order of birth in the two groups L_0 and L_{1+}.

It is seen from the table and the figure that for puerperal fatality as well as for infant loss the rates in the group L_{1+} were higher than those in the group L_0 for every order of birth except one. The increase in the rates of both puerperal fatality and infant loss asso-

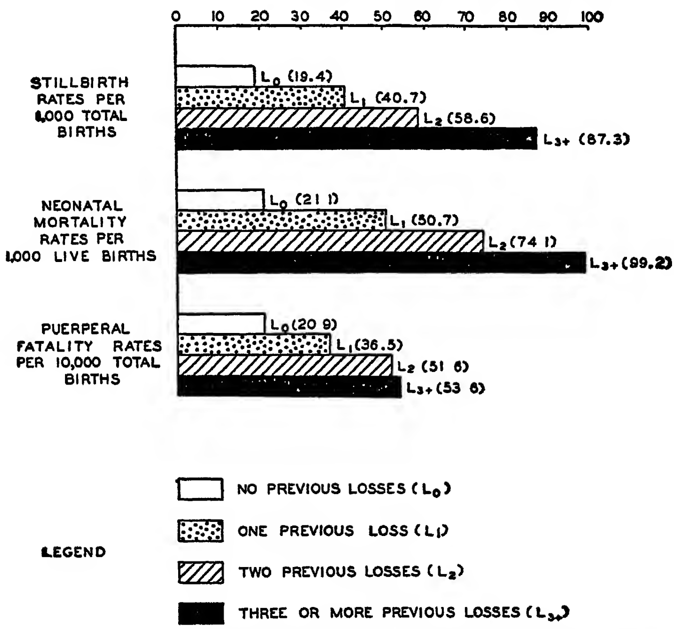


FIGURE 1.—Stillbirth, neonatal mortality, and puerperal fatality rates according to the number of previous losses to the mother, second births and over, New York State, exclusive of New York City, 1936–38

ciated with previous losses was more pronounced in the lower orders of birth than in the higher. The largest increase in the stillbirth and neonatal mortality rates was noted for second births. This extra hazard to second births whose siblings were lost results in somewhat different distributions of the stillbirth and neonatal mortality rates by order of birth in the two groups L_0 and L_{1+}. Whereas in the group L_0 the stillbirth and neonatal mortality rates were lowest for lower orders of birth and increased with advancing parity, in the group L_{1+} the rates for second births were very high. In fact the rates for the highest orders of birth were of the same order of magnitude as those for second births. For puerperal fatality the increase among second births in the group L_{1+} over that of L_0 was not as large as in the case of the rates for infant loss.

TABLE 4.—*Stillbirth, neonatal mortality and puerperal fatality rates by order of birth and previous obstetrical history of mother, second births and over, New York State (exclusive of New York City), 1936–38*

Order of birth	Live births		Stillbirths		Neonatal deaths		Puerperal deaths	
	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss
	L_0	L_{1+}	L_0	L_{1+}	L_0	L_{1+}	L_0	L_{1+}
2	57,372	5,270	954	282	1,155	452	109	16
3	28,545	6,353	537	300	569	364	47	17
4	15,319	5,474	323	227	348	286	34	23
5	8,472	4,243	227	215	194	252	21	23
6 and 7	7,840	6,481	200	323	195	343	28	27
8 and 9	2,799	3,784	102	225	65	177	14	29
10 and over	1,260	3,781	58	211	35	210	7	16

Order of birth	Rates					
	Stillbirth [1]		Neonatal mortality [2]		Puerperal fatality [3]	
2	16.4	50.8	20.1	85.8	18.7	28.8
3	18.5	45.1	19.9	57.3	16.2	25.6
4	20.6	39.8	22.7	52.2	21.7	40.3
5	26.1	48 2	22.9	59.4	24.1	51.6
6 and 7	24.9	47.5	24.9	52 9	34.8	39.7
8 and 9	35.2	56.1	23.2	46.8	48.3	72.3
10 and over	44.0	52.9	27.8	55.5	53.1	40.1

[1] Stillbirth rates per 1,000 total births (live births and stillbirths).
[2] Neonatal mortality rates per 1,000 live births.
[3] Puerperal fatality rates per 10,000 total births.

It may be of interest to note that the increase with parity in the group L_0 was very much more pronounced for stillbirths and puerperal fatality than it was for neonatal mortality, while in the group L_{1+} the increase in the neonatal mortality rate with advancing parity was similar to that of the other two rates. The difference between the stillbirth rate and the neonatal mortality rate may also be noted in a different way. In the group L_0 the stillbirth rate for the higher orders of birth was considerably higher than the neonatal mortality rate, whereas in the lower orders of birth the rate was slightly higher for neonatal mortality than for stillbirths. In the group L_{1+} no such difference appears. This fact may be of some significance, particularly because the stillbirth rate is presumably more closely related to obstetrical problems than the neonatal mortality rate. It is thus noteworthy that when the habitual offenders (the group L_{1+}) have been excluded there remains only a slight increase in the neonatal mortality rate with parity, while in the stillbirth and the puerperal fatality rates the increase with parity is considerable even after all the women who had had previous losses have been eliminated.

Table 5 presents the rates for puerperal fatality and for infant loss (combined stillbirth and neonatal deaths) by order of birth according to the number of previous losses to the mother. It may be observed that the late fetal (stillbirth) and neonatal mortality rate increased

very markedly with advancing number of previous losses in every order of birth. The increase in the puerperal fatality rate with increasing number of previous losses was neither very marked nor regular.

Following the late fetal and neonatal mortality rates horizontally along the table, that is, keeping the order of birth constant and noting

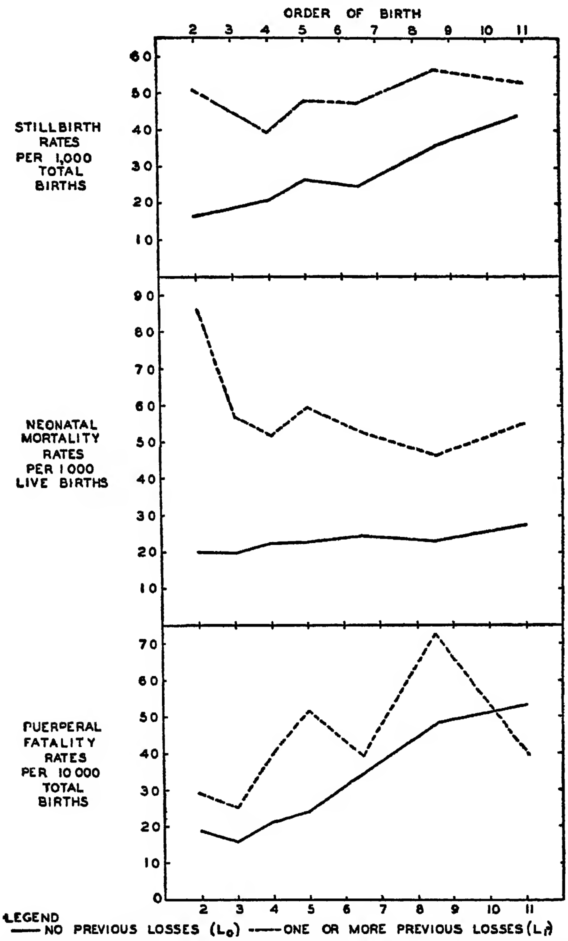


FIGURE 2.—Stillbirth, neonatal mortality, and puerperal fatality rates by order of birth for mothers who had lost none of their previous children (L_0), and for mothers who had lost one or more previous children (L_{1+}), second births and over, New York State, exclusive of New York City, 1936–38.

the variations with advancing number of losses, it will be observed that the rate increased progressively from a minimum in L_0 to a maximum in the groups with the largest number of losses. When the rates are followed vertically down the table, that is, when the number of losses is kept constant and the variations with order of birth are noted, it is found that in the group L_0 the rates increased progres-

TABLE 5.—*Late fetal and neonatal mortality and puerperal fatality by order of birth according to the number of previous losses to the mother, second births and over, New York State (exclusive of New York City), 1936–38*

Order of birth	Total births				Late fetal and neonatal deaths				Puerperal deaths			
	Number of previous losses				Number of previous losses				Number of previous losses			
	0	1	2	3 and over	0	1	2	3 and over	0	1	2	3 and over
2	58,326	5,552			2,109	734			109	16		
3 and 4	44,724	10,577	1,657	120	1,777	838	292	47	81	33	5	2
5, 6, and 7	16,739	7,763	2,527	972	816	610	311	212	49	36	10	4
8 and over	4,219	3,524	2,211	2,266	260	267	218	338	21	15	18	12

Order of birth	Rates							
	Late fetal and neonatal mortality (combined)[1]				Puerperal fatality[2]			
2	36.2	132.2			18.7	28.8		
3 and 4	39.7	79.2	176.2	391.7	18.1	31.2	30.2	166.7
5, 6, and 7	48.7	78.6	123.1	218.1	29.3	46.4	39.6	41.2
8 and over	61.6	75.8	98.6	149.2	49.8	42.6	81.4	53.0

[1] Stillbirths and neonatal deaths (combined) per 1,000 total births (including stillbirths).
[2] Per 10,000 total births (including stillbirths).

sively with advancing order of birth, while in the groups that had had previous losses the increase with order of birth was not so pronounced. In fact in the case of late fetal and neonatal mortality, the rates started high for the lower orders of birth and decreased with increasing order of birth. This finding may be explained partly by the fact that the losses represent a larger proportion of the births in the lower than in the higher orders of birth; the mothers of the lower orders of birth who had had a particular number of losses are presumably a more vulnerable group than are the mothers of the higher orders of birth who had had the same number of losses. It should also be considered that a selective factor may be operating in that mothers who lose many of their offspring may represent a weaker group. Thus some of the women who are characteristic of this group and who probably would have contributed a relatively large number of losses are not present among the mothers of this study. Their absence from the group of women who are being delivered in a given year may be accounted for by death in a previous pregnancy, by therapeutic sterilization, or by use of contraceptives.

Age of mother.—The analysis of the association between infant and puerperal fatality and the previous losses according to age of mother yields results which are substantially the same as those by order of birth. Age of mother is known to be strongly related to the fatality of both mother and infant (*3, 4*). The stillbirth and neonatal mortality rates are relatively high for young and for old mothers and

generally lower for mothers in the intermediary ages. Puerperal fatality increases continuously with advancing age.

The increase in the puerperal fatality rate and in the late fetal and neonatal mortality rate associated with previous losses was present to a considerable degree in every age group of mother. The increase in the mortality of the group L_{1+} over that of L_0 was more pronounced for the younger than for the older mothers. The mortality of both mother and infant increased with advancing age of mother in both groups L_{1+} and L_0. The main difference between puerperal fatality and the stillbirth and neonatal mortality rates was that whereas the rates for infant loss were generally higher for young mothers than for mothers of the intermediary ages, the puerperal fatality rate was at a minimum for the youngest mothers and increased thereafter with advancing age. This was true both for mothers who had had previous losses (L_{1+}) and for mothers whose previous children had all survived (L_0).

As the number of previous losses increased, there was a regular increase in the late fetal and neonatal mortality in every age group of mother. In the case of puerperal fatality the increase over the group with no previous losses was noticeable, but the increase with the number of previous losses was not regular. The puerperal fatality increased sharply with advancing age of mother in each one of the groups L_1. The U-shaped pattern of the late fetal and neonatal mortality rates, that is, the higher rates for young and older mothers and lower rates for the intermediary ages, was also present in each one of the groups L_1.

Order of birth and age of mother are, obviously, closely correlated. The older mothers generally had previously had more births than the younger mothers. The more births to the mother the greater are the chances of having lost one or more of the previous children. Consequently, in order to obtain a clearer picture of the association between loss of mother and infant in the current delivery and the previous losses to the mother, it is desirable to study not only the factors of order of birth and age of mother separately but also in conjunction with one another. This is accomplished in table 6, which presents the association between puerperal fatality, late fetal and neonatal mortality, and the history of previous losses to the mother by order of birth and age of mother.

This table shows that the increase in the rate of loss of both mother and infant associated with previous losses was present to a considerable degree also when the two factors of order of birth and age of mother were eliminated, for the increase in the group L_{1+} over that of L_0 was present in practically every one of the combinations of order of birth and age of mother. Thus, for example, for second births the rate in the group L_{1+} was higher than that in the group L_0 in every

age group of mother. Similarly, in any one of the age groups of mother the rates in L_{1+} were higher than those in L_0 in each one of the orders of birth. It is therefore indicated that the higher rates of puerperal fatality and of infant loss associated with the loss of previous children to the mother may not be explained on the basis of the difference in parity and age between the two groups L_{1+} and L_0.

TABLE 6.—*Late fetal and neonatal mortality and puerperal fatality rates by order of birth, age of mother and previous losses, second births and over, New York State (exclusive of New York City), 1936–38*

Age of mother (years)	Order of birth: 2		3 and 4		5, 6, and 7		8 and over	
	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss	No previous losses	At least 1 previous loss
	L_0	L_{1+}	L_0	L_{1+}	L_0	L_{1+}	L_0	L_{1+}
	Total births							
Under 20	3,268	449	396	182				
20–24	20,840	1,976	9,800	2,825	605	468		
25–29	19,476	1,675	15,295	3,905	4,590	3,225		
30–34	10,674	993	11,774	3,199	5,728	3,558	1,408	2,615
35–39	3,504	875	5,991	1,734	4,203	2,847	1,632	3,018
40 and over	560	84	1,463	449	1,612	1,163	1,179	2,366
	Late fetal and neonatal mortality rates [1]							
Under 20	43.8	171.5	60.6	153.8				
20–24	34.3	122.5	33.8	86.7	44.6	104.7		
25–29	31.6	124.8	32.2	85.0	38.3	83.1		
30–34	38.9	131.9	40.0	94.7	44.7	95.3	43.3	85.7
35–39	52.5	162.7	56.3	110.7	56.6	114.2	62.5	99.4
40 and over	66.1	166.7	82.0	160.4	73.2	129.8	82.3	126.0
	Puerperal fatality rates [2]							
Under 20	9.2	22.3						
20–24	11.5	15.2	5.1	10.6	33.1	64.1		
25–29	19.0	29.9	17.0	37.8	15.3	24.8		
30–34	20.0	50.4	18.7	25.0	22.7	28.1	42.6	42.1
35–39	34.2	53.3	36.7	40.4	45.2	45.7	61.3	56.3
40 and over	35.7		41.0	155.9	49.6	137.6	42.4	71.9

[1] Stillbirths and neonatal deaths per 1,000 total births (including stillbirths).
[2] Per 10,000 total births (including still births).

PREMATURE BIRTH

That a tendency to premature birth is of a repetitive character has been shown in a previous study (*1*). That is, it was shown that mothers who had previously had one or more premature births are more likely to have premature births in an ensuing pregnancy than are mothers who have been delivered of all their previous births at term. It is also known that the stillbirth and neonatal mortality rates as well as the puerperal fatality rate associated with premature deliveries are very much higher than those associated with full-term deliveries. This increase is of a larger magnitude in stillbirth and

neonatal mortality than it is in puerperal fatality (*2*, *4*). It is therefore to be expected that the incidence of premature birth, that is, the number of premature deliveries per 1,000 total births, should be higher among mothers who had had previous losses than among mothers who had not had such losses. Since premature birth takes such a heavy toll of infants in their first month of life, it is desirable to investigate separately for full term and premature infants the association between infant and puerperal fatality and previous losses.

The incidence of premature birth was more than twice as high among mothers who had had previous losses as among mothers all of whose previous issue survived. Among the mothers of the 124,008 births in the group L_0 there were 5,146 premature births (41.5 per 1,000 total births) while among the mothers of the 37,169 births in the group L_{1+} there were 3,400 premature births (91.5 per 1,000 total births). The incidence of premature birth increased sharply with increasing number of previous losses. For mothers who had lost only one of their previous children the incidence was 79.9. It increased to 113.7 for mothers who had lost two of their previous children. The incidence was 133.0 in the group L_3 and 159.4 in the group L_{4+}. The incidence of premature birth in the entire group of births of orders 2 and over was 53.0 per 1,000 total births.

The late fetal and neonatal mortality rate among premature births was 568.5 per 1,000 total premature births. The corresponding rate among full-term births was 26.0. The rate was, therefore, over 20 times as high among premature as among full-term births. The puerperal fatality rate was 152.1 per 10,000 total births when pregnancy terminated prematurely and 18.1 when delivery was at term. Thus the puerperal fatality rate was over 8 times as high among the premature as among the full-term deliveries. The higher rates for puerperal fatality and for infant loss associated with previous losses were present to a considerable degree in the premature as well as in the full-term deliveries. Thus the puerperal fatality rate among full-term deliveries was 16.0 in the group L_0 and 25.8 in the group L_{1+}. The corresponding rates among the premature deliveries were 134.1 and 179.4, respectively. Similarly the late fetal and neonatal mortality rates of full-term births were 20.0 for the group L_0 and 47.1 for the group L_{1+}. The corresponding rates for the premature births were 501.4 and 670.0, respectively. The increase in the rates of loss of mother and infant associated with previous losses was relatively greater among the full-term than among the premature births. It is therefore indicated that only a part of the extra hazard to mother and infant in the families which had sustained the loss of previous children is due to a repetitive tendency to premature birth among some of the mothers. There appears to be higher risk of death to mother and

infant in the families in which there were previous losses which may not be explained by the factor of premature birth.

DISCUSSION

The fatality of the mother and the infant are very strongly correlated. The rate for infant loss in the form of stillbirth and neonatal mortality rises considerably when the mother dies in childbirth and, similarly, puerperal fatality increases sharply when the infant is either stillborn or dies neonatally. For births of orders 2 and over, the late fetal and neonatal mortality rate was 53.8 per 1,000 total births when the mother survived and 450.1 when the mother died. The puerperal fatality rate was 14.8 per 10,000 total births when the infant survived and 209.5 when the infant was either a stillbirth or a neonatal death. Since the puerperal fatality rate as well as the rate of infant loss was found to be related to the previous losses to the mother it may be desirable to consider this three-way relationship between puerperal fatality, late fetal and neonatal mortality, and the previous losses to the mother.

Among the 124,008 births in the group with no previous losses (L_0) there were 4,858 cases in which the infant was lost and the mother survived, there were 156 cases in which the mother was lost and the infant survived, and 104 cases in which both mother and infant were lost. The corresponding figures in the group with one or more previous losses (L_{1+}) were as follows: Among 37,169 births, in 3,786 cases the infant alone was lost, in 70 cases the mother only was lost, and in 81 cases both the mother and the infant were lost. From these figures the following probabilities of losing infant only, mother only, and both mother and infant may be determined for the group L_0 and for L_{1+}. In terms of chances per 10,000 births these probabilities were:

	Mothers who had had no previous losses (L_0)	Mothers who had had one or more previous losses (L_{1+})
Losing infant only	391.7	1018.6
Losing mother only	12.6	18.8
Losing both mother and infant	8.4	21.8

Several interesting points appear in these probabilities. In the first place, the association between puerperal fatality and the rate of infant loss in the current delivery is apparent from the relatively high probabilities of losing both mother and infant. The theoretical probabilities of losing both mother and infant, based on the assumption that there is no correlation between the two, would be 0.84 per 10,000 births in L_0 and 4.2 in L_{1+} compared with the actual observed probabilities of 8.4 and 21.8 in L_0 and L_{1+}, respectively. The fact that

the probabilities are higher in L_{1+} than in L_0 for each one of the three classifications (that is, for loss of infant only, mother only, and both mother and infant) would indicate that the previous losses to the mother are independently related to both puerperal fatality and infant loss. However, the relation seems to be much more pronounced for infant loss than for puerperal fatality, for the increase in the probabilities is greater for the former than for the latter. Thus, the probabilities of losing infant only are 2.6 times as great in the group L_{1+} as in the group L_0. The probabilities of losing both infant and mother are also 2.6 times as high in L_{1+} as in L_0. On the other hand, the chances of losing mother only are only 1.5 times as high among mothers with a history of previous losses as among mothers whose previous issue all survived. In fact, the association between previous losses and the rate for infant loss is so strong that whereas in the group L_0 the chances of losing both mother and infant (8.4) were lower than those of losing mother only (12.6), in the group L_{1+} the probability of losing both mother and infant (21.8) was higher than the probability of losing mother only (18.8). In every 10,000 births in the group L_{1+} there were 40.6 cases in which the mother died and in 21.8 of these the infant was also lost. It appears therefore that when a mother who had had previous losses dies in a subsequent delivery there is more than a 50–50 chance that the infant will also be lost either through stillbirth or neonatal mortality.

The very strong association between the rate for infant loss in the current delivery and the previous losses to the mother makes it difficult to study in more detail the relation between puerperal fatality and previous losses independently of infant loss. For example, the 50 percent increase in the probabilities of losing mother only (18.8 in L_{1+} against 12.6 in L_0) may be considered only a minimum measure of the extra risk to the mother associated with previous losses, since the majority of the most vulnerable mothers (those in which both mother and infant died) have been of necessity excluded. Moreover, the factors of order of birth and age of mother may not easily be taken account of, since the number of puerperal deaths remaining after elimination of the cases in which both mother and infant were lost is too small to yield stable rates.

The fact that the previous losses to the mother are more strongly related to the rate of infant loss than to puerperal fatality is instructive. Whether the causes underlying these cases of repeated losses are environmental or congenital or both, they would seem to affect puerperal fatality to a lesser degree than they do the stillbirth and neonatal mortality rates. One may speculate that, among other things, the father may also play an important part in these cases of repeated losses in the family. It is possible that some of the cases in which the infant is repeatedly lost may have their origin in some

defect in the father. Moreover, it is reasonable to assume that certain vital factors in the father are more closely related to the survival of the fetus than to that of the mother. It would probably be difficult to study this relationship for many of these vital factors. However, for the more easily accessible index, that of age, a definite relationship has been established between age of father and the survival of his offspring (*5*). The stillbirth and neonatal mortality rates were found to be high for very young and old fathers and relatively low for fathers aged 25–34. It may therefore be indicated that the study of infant loss should embrace also factors in the father. This seems to be especially important in the cases of habitual aborters, or in cases of families in which many infants have been lost through stillbirth and neonatal mortality.

SUMMARY

This is the third in a series of studies on childbirth mortality (mother and infant) based on the vital statistics records of over a quarter of a million deliveries occurring in New York State (exclusive of New York City) in the 3-year period 1936–38. The maternal death certificate was matched with the birth or stillbirth certificate of the infant. Similarly the death certificate of every infant who died under 1 month of age was matched with the birth certificate of the same infant. The information from each of the matched certificates was brought together on the same punch card.

Women whose deaths were associated with miscarriages, abortions, ectopic pregnancies, and those who died undelivered were excluded. These studies are concerned with the risk to the mother which is associated with the delivery of an offspring of viable age. The risk is defined as "puerperal fatality" and is measured by a "puerperal fatality rate" defined as the number of deaths of women who were delivered either of a live birth or of a stillbirth per 10,000 total deliveries.

This paper deals with puerperal fatality and late fetal and neonatal mortality in their relation to the mother's previous infant losses. The following findings are recorded:

1. Of the 161,177 births of orders 2 and over entering into this study, 76.9 percent were to mothers whose previous issue had all survived and 23.1 percent were to mothers who had lost one or more previous children.

2. The rates of loss of both mother and infant were about twice as high in the group with a history of previous loss as in the group with no previous loss. The respective rates in the two groups were 40.6 and 20.9 per 10,000 total births for puerperal fatality, 48.0 and 19.4 per 1,000 total births for stillbirth, and 58.9 and 21.1 per 1,000 live births for neonatal mortality.

3. While the increase in the fatality of mothers with previous losses was present in all causes of death, the relative increase was greater for some causes than for others. Thus, a considerably larger proportion of deaths in this group of mothers was due to accidents of pregnancy (International List No. 141) and to abortion (International List No. 140) and a smaller proportion of the deaths was due to hemorrhage and septicemia.

4. The higher the number of previous losses to the mother, the greater was the chance of death to both mother and infant. The increase with advancing number of previous losses was more pronounced for the loss of offspring than it was for the loss of mother.

5. The higher rates of puerperal fatality and of infant loss associated with the loss of previous children to the mother may not be explained on the basis of differences in parity and age of mother. The increase in the rates among mothers with a history of previous losses was present in every one of the combinations of order of birth and age of mother.

6. The higher rates for puerperal fatality and for infant loss associated with previous losses were present to a considerable degree in the premature as well as in the full-term deliveries. The puerperal fatality rate for full-term deliveries was 16.0 among mothers with no history of previous losses and 25.8 among mothers who had lost one or more of their previous children. The corresponding rates among the premature deliveries were 134.1 and 179.4, respectively. Similarly, the late fetal and neonatal mortality rates were 20.0 and 47.1 among full-term births and 501.4 and 670.0 among the premature.

7. The previous losses to the mothers were found to be more strongly related to loss of offspring than to loss of mother. The suggestion is made that the father may also play an important part in these cases of repeated losses in the family.

REFERENCES

(*1*) Gardiner, E. M., and Yerushalmy, J.: Familial susceptibility to stillbirths and neonatal deaths. Am. J. Hyg., **30**: 11–31 (1939).
(*2*) Yerushalmy, J., Kramer, M., and Gardiner, E. M.: Studies in childbirth mortality. I. Puerperal fatality and loss of offspring. Pub. Health Rep., **55**: 1010–1027 (1940).
(*3*) Yerushalmy, J., Palmer, C. E., and Kramer, M.: Studies in childbirth mortality. II. Age and parity as factors in puerperal fatality. Pub. Health Rep., **55**: 1195–1220 (1940).
(*4*) Yerushalmy, J.: Neonatal mortality by order of birth and age of parents. Am. J. Hyg., **28**: 244–270 (1938).
(*5*) Yerushalmy, J.: Age of father and survival of offspring. Human Biol., **11**: 342–356 (1939).

COURT DECISION ON PUBLIC HEALTH

City ordinance relating to the purchase and sale of eggs upheld.—(Minnesota Supreme Court; *State* v. *Houston*, 298 N.W. 358; decided May 29, 1941.) An ordinance of the city of Minneapolis relating to the

purchase and sale of eggs established grades for the retail trade of eggs in the city. All eggs that were not graded had to be marked "unclassified" but nothing in the ordinance made grading compulsory. The defendant was charged with selling a quantity of eggs, some of which were in fact grade B and undergrade, as grade A. He was convicted of violating the ordinance and appealed to the Supreme Court of Minnesota.

It was urged on appeal that the ordinance was void, the first reason assigned being that the city lacked the power to pass it. In holding that this contention was without merit the appellate court said that the necessary authority was found in several provisions of the city charter. There were quoted portions of the charter which authorized ordinances for the government and good order of the city and which gave authority, by such ordinances, to license and regulate shops for the sale of provisions, to regulate the inspection of provisions, and to make all regulations which might be necessary and expedient for the preservation of health and the suppression of disease. The court said that, regardless of whether the ordinance was authorized by the general welfare clause of the charter, it was clear that it was authorized by the other subsections quoted. "While the word 'eggs' is not specifically mentioned, in any of the subsections, the word 'provisions' is used, and eggs are provisions as that term is commonly understood."

The next claim made by the defendant was that, if the city ever possessed the power to pass the ordinance, such power was taken away by the enactment of chapter 471, Laws of 1937. This law related to the grading, etc., of eggs and, by virtue of the authority granted therein, the State department of agriculture promulgated certain regulations regarding the grading and sale of eggs, which regulations were substantially the same as those contained in the city ordinance. There was no express provision in the statute prohibiting any municipality from legislating on the same subject matter, nor was anything found in the act from which such prohibition might be implied. The supreme court stated that a municipality, if it had proper delegated authority and if it legislated consistently with State law, could make an act an offense against the municipality although it was by statute an offense against the State. "Such an ordinance does not punish the violation of the State law but establishes a local law, the infraction of which it punishes." The court held that the ordinance did not conflict with the State law, was not an infringement thereof, and that the statute did not take from the city council the power to pass the ordinance.

The final claim of the defendant was that the ordinance was unnecessary to the regulation of the subject matter and was so unreasonable as to be an arbitrary exercise of power and void. In rejecting this contention it was said that courts had no power to declare an ordinance

void as being unreasonable unless the unreasonableness was so clear, manifest, and undoubted as to amount to a mere arbitrary exercise of the power vested in the legislative body, and that the court did not so consider the instant ordinance.

The judgment appealed from was affirmed.

DEATHS DURING WEEK ENDED JULY 5, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended July 5, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,773	7,116
Average for 3 prior years	7,187	
Total deaths, first 27 weeks of year	238,766	238,492
Deaths per 1,000 population, first 27 weeks of year, annual rate	12.3	12.3
Deaths under 1 year of age	444	436
Average for 3 prior years	476	
Deaths under 1 year of age, first 27 weeks of year	14,119	13,669
Data from industrial insurance companies:		
Policies in force	64,397,986	65,119,180
Number of death claims	8,913	8,858
Death claims per 1,000 policies in force, annual rate	7.2	7.1
Death claims per 1,000 policies, first 27 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 12, 1941

Summary

A total of 187 cases of poliomyelitis was reported for the current week, as compared with 82 cases for the preceding week. The highest incidence was shown for the South Atlantic and East South Central States, which reported 127, or approximately 68 percent, of the total number of cases reported for the week. The 5-year (1936–40) median for the week is 135 cases.

Increases in the States having the largest numbers of cases, as compared with last week, were as follows: Georgia, 19 to 40; Alabama, 22 to 40; South Carolina, 3 to 13; Kentucky, 2 to 10; Florida, 6 to 11; Illinois, 5 to 9; Minnesota, 2 to 6; Pennsylvania, 4 to 7; Tennessee, 0 to 5; Texas, 4 to 8; Washington State, 0 to 5; and California, 3 to 8.

To date (first 28 weeks) this year, a total of 983 cases has been reported in the country as a whole, which was exceeded in only two of the preceding 5 years—1939 (1,011 cases) and 1937 (1,346 cases). For the corresponding period of 1940, 948 cases were reported, although the total for that year (9,799) was higher than for any other year since 1935, when 10,839 cases were recorded.

An outbreak of encephalitis has been reported in North Dakota, with 35 cases since January 1, of which 25 occurred during the period July 1–12. Seventeen of the cases were in Cass County.

Of 17 cases of Rocky Mountain spotted fever reported for the current week, 9 occurred in the eastern States, and 4 in North Carolina; and of 52 cases of endemic typhus fever, 18 were in Georgia, 13 in Texas, and 11 in Alabama. Four cases of tularemia were reported in Mississippi.

The death rate for the current week in 88 major cities in the United States is 11.1 per 1,000 population (annual basis), as compared with 10.9 for the preceding week and with a 3-year (1938–40) average of 10.8. The cumulative rate for these cities to date (first 28 weeks) this year is 12.3, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended July 12, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria: Week ended— July 12, 1941	Diphtheria: Week ended— July 13, 1940	Diphtheria: Median 1936–40	Influenza: Week ended— July 12, 1941	Influenza: Week ended— July 13, 1940	Influenza: Median 1936–40	Measles: Week ended— July 12, 1941	Measles: Week ended— July 13, 1940	Measles: Median 1936–40	Meningitis, meningococcus: Week ended— July 12, 1941	Meningitis, meningococcus: Week ended— July 13, 1940	Meningitis, meningococcus: Median 1936–40
NEW ENG.												
Maine	0	1	1	------	------	------	103	141	50	0	0	0
New Hampshire	0	0	0	------	------	------	15	0	3	0	0	0
Vermont	0	0	0	------	------	------	47	8	12	0	0	0
Massachusetts	4	2	3	------	------	------	493	774	377	2	0	1
Rhode Island	1	0	0	------	------	------	9	59	17	0	0	0
Connecticut	1	0	1	------	1	1	220	8	51	0	0	0
MID. ATL.												
New York [5]	14	15	25	[1] 3	[1] 2	[1] 3	915	681	840	8	1	2
New Jersey	6	9	7	1	4	4	500	749	247	3	0	0
Pennsylvania	4	9	15	------	------	------	1,086	245	287	3	1	3
E. NO. CEN.												
Ohio [2]	2	8	10	1	6	6	435	12	77	1	0	2
Indiana	1	2	6	5	------	6	31	9	9	0	1	1
Illinois [2]	12	25	22	2	2	7	228	256	91	1	0	2
Michigan [3]	4	1	14	1	6	------	518	370	137	1	1	1
Wisconsin	1	0	3	6	9	9	606	621	190	1	2	0
W. NO. CEN.												
Minnesota	1	1	1	------	------	1	7	18	29	0	0	0
Iowa [2]	4	0	2	2	3	------	71	35	35	0	1	0
Missouri	1	0	6	------	------	------	58	2	15	1	0	1
North Dakota [4]	3	0	1	------	------	------	8	0	0	0	0	0
South Dakota	0	0	1	------	------	------	7	0	2	1	0	0
Nebraska	0	1	1	------	------	------	9	13	8	0	1	1
Kansas	1	4	3	------	1	2	55	53	10	1	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	6	0	1	0	0	0
Maryland [2,3]	1	0	2	1	1	2	247	4	27	1	0	1
Dist. of Col.	0	5	5	------	------	------	37	1	33	0	0	0
Virginia [2]	2	4	7	26	36	------	279	36	60	0	1	3
West Virginia [3]	3	2	3	------	2	7	203	6	20	2	2	1
North Carolina [2,5]	3	2	9	------	------	1	285	48	82	1	1	3
South Carolina	8	3	3	105	105	69	182	6	8	0	0	1
Georgia [5]	2	2	5	6	28	------	93	15	------	0	0	1
Florida [5]	1	3	3	23	2	------	16	16	11	0	0	1
E. SO. CEN.												
Kentucky	1	1	4	------	4	2	77	42	15	0	1	2
Tennessee	1	2	3	21	12	12	71	25	22	3	1	1
Alabama [5]	5	1	9	5	7	7	62	53	10	2	1	1
Mississippi [3,5]	3	8	8	------	------	------	------	------	------	1	0	0
W. SO. CEN.												
Arkansas	2	2	5	1	1	4	50	16	16	1	1	1
Louisiana	1	4	4	1	10	18	1	1	6	0	1	1
Oklahoma	3	4	4	5	13	7	41	4	14	1	1	1
Texas [5]	10	13	20	289	44	67	145	125	85	2	1	1
MOUNTAIN												
Montana [2]	3	0	0	------	------	------	21	22	22	0	0	0
Idaho	1	1	1	------	------	1	3	12	5	1	0	0
Wyoming [2]	0	0	0	------	------	------	5	12	3	0	0	0
Colorado	4	5	5	6	------	------	32	10	16	0	0	0
New Mexico	1	0	0	------	------	------	13	10	8	0	0	0
Arizona	0	0	1	27	24	10	37	41	17	0	0	0
Utah [2,3]	0	0	1	------	------	------	8	69	32	0	0	0
Nevada [2]	0	------	------	------	------	------	26	------	------	0	------	------
PACIFIC												
Washington	0	1	0	3	------	------	7	48	48	0	0	0
Oregon	4	1	1	7	1	4	17	35	18	0	0	0
California	12	10	18	33	5	16	179	129	323	0	2	2
Total	131	152	300	580	329	374	7,564	4,840	3,912	38	22	37
28 weeks	6,851	8,050	12,244	596,541	167,313	150,230	817,027	217,367	262,949	1,275	1,026	1,963

See footnotes at end of table.

200327°

Telegraphic morbidity reports from State health officers for the week ended July 1 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	July 12, 1941	July 13, 1940		July 12, 1941	July 13, 1940		July 12, 1941	July 13, 1940		July 12, 1941	July 13, 1940	
NEW ENG.												
Maine	0	0	0	0	3	10	0	0	0	0	2	1
New Hampshire	0	0	0	1	1	1	0	0	0	0	0	0
Vermont	0	0	1	3	2	2	0	0	0	0	0	0
Massachusetts	0	0	1	62	66	66	0	0	0	3	2	2
Rhode Island	0	0	0	0	4	6	0	0	0	1	2	0
Connecticut	0	2	0	8	26	13	0	0	0	0	5	4
MID. ATL.												
New York [5]	2	1	4	113	181	155	0	0	0	8	1	13
New Jersey	0	0	1	37	110	31	0	0	0	2	8	6
Pennsylvania	7	0	0	50	120	121	0	0	0	8	14	14
E. NO. CEN.												
Ohio [2]	3	1	1	47	52	78	0	0	0	6	6	9
Indiana	1	3	1	22	7	18	0	1	2	7	0	8
Illinois [2]	9	0	5	97	206	87	4	1	11	12	9	17
Michigan [3]	3	4	3	74	102	129	4	0	0	5	6	3
Wisconsin	0	1	0	37	53	55	0	2	2	1	0	1
W. NO. CEN.												
Minnesota	6	0	1	20	24	31	0	0	4	0	3	0
Iowa [3]	2	5	0	17	10	19	2	11	11	0	1	2
Missouri	1	0	1	18	5	18	0	1	5	9	4	7
North Dakota [4]	0	0	0	1	3	3	0	5	4	1	1	0
South Dakota	2	0	0	3	5	5	4	16	5	1	0	0
Nebraska	0	0	0	9	3	5	0	1	3	0	1	1
Kansas	0	4	2	19	25	25	0	0	1	1	1	5
SO. ATL.												
Delaware	0	1	0	4	3	2	0	0	0	1	0	1
Maryland [2, 3]	1	0	0	14	7	15	0	0	0	5	4	4
Dist. of Col.	0	0	0	3	8	3	0	0	0	0	0	3
Virginia [2]	5	1	1	8	10	10	0	0	0	8	8	18
West Virginia [3]	0	2	2	7	16	16	0	0	0	2	5	5
North Carolina [2, 5]	0	2	2	1	16	17	0	1	0	7	4	19
South Carolina	13	3	1	6	0	1	0	0	0	10	10	16
Georgia [5]	40	0	1	7	4	5	0	0	0	19	15	39
Florida [5]	11	0	0	0	2	2	0	0	0	5	4	1
E. SO. CEN.												
Kentucky	10	3	3	24	14	10	0	0	0	10	8	37
Tennessee	5	0	2	17	5	4	0	0	0	11	3	32
Alabama [5]	40	5	3	8	10	10	0	1	0	7	2	15
Mississippi [3, 5]	2	0	0	10	1	3	0	0	0	7	5	11
W. SO. CEN.												
Arkansas	0	2	1	0	5	5	0	0	0	14	25	25
Louisiana	1	3	1	1	6	6	0	0	0	12	22	21
Oklahoma	1	2	1	11	3	5	0	2	1	17	8	26
Texas [5]	8	7	7	12	8	17	0	3	0	43	33	33
MOUNTAIN												
Montana [2]	0	1	0	14	3	8	0	1	1	0	1	1
Idaho	0	0	0	10	0	3	1	0	2	1	0	0
Wyoming [2]	0	0	0	1	3	3	0	0	0	0	0	0
Colorado	0	0	0	5	16	16	0	1	2	1	2	2
New Mexico	0	1	1	0	1	4	0	0	0	0	1	5
Arizona	0	0	0	0	1	2	0	0	0	3	5	4
Utah [2, 3]	0	1	0	4	4	6	0	0	0	0	0	1
Nevada [3]	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	5	17	0	11	14	14	0	1	1	1	3	3
Oregon	1	2	0	4	4	9	1	1	1	0	1	8
California	8	27	19	58	53	66	0	0	7	4	3	11
Total	187	101	135	878	1,225	1,298	16	49	91	253	238	437
28 weeks	983	948	948	88,657	115,292	132,945	1,149	1,843	7,557	2,944	3,099	4,601

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 12, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— July 12, 1941	Whooping cough, Week ended— July 13, 1940	Division and State	Whooping cough, Week ended— July 12, 1941	Whooping cough, Week ended— July 13, 1940
NEW ENG.			SO. ATL.—continued		
Maine	27	12	Georgia [5]	10	20
New Hampshire	1	0	Florida [5]	13	10
Vermont	1	16	E. SO. CEN.		
Massachusetts	116	105	Kentucky	64	92
Rhode Island	12	2	Tennessee	56	48
Connecticut	21	63	Alabama [5]	26	17
MID. ATL.			Mississippi [3 5]		
New York [5]	301	265	W. SO. CEN.		
New Jersey	135	142	Arkansas	13	36
Pennsylvania	293	357	Louisiana	27	64
E. NO. CEN.			Oklahoma	27	19
Ohio [2]	267	270	Texas [5]	250	210
Indiana	30	12	MOUNTAIN		
Illinois [2]	145	157	Montana [2]	10	8
Michigan [3]	268	261	Idaho	27	14
Wisconsin	168	108	Wyoming [2]	10	6
W. NO. CEN.			Colorado	196	11
Minnesota	76	43	New Mexico	15	18
Iowa [2]	55	7	Arizona	14	0
Missouri	64	33	Utah [2 3]	79	117
North Dakota [4]	20	9	Nevada [2]	24	
South Dakota	3	6	PACIFIC		
Nebraska	11	6	Washington	117	65
Kansas	164	61	Oregon	16	28
SO. ATL.			California	402	242
Delaware	7	11	Total	4,123	3,465
Maryland [2 3]	65	144	28 weeks	127,297	90,001
District of Columbia	1	13			
Virginia [2]	46	110			
West Virginia [3]	36	91			
North Carolina [2 5]	229	121			
South Carolina	165	15			

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended July 12, 1941, 17 cases, as follows: Ohio, 1; Illinois, 1; Iowa, 1; Maryland, 1; Virginia, 1; North Carolina, 4; Montana, 2; Wyoming, 2; Utah, 3; Nevada, 1.
[3] Period ended earlier than Saturday.
[4] Encephalitis, North Dakota, Jan. 1–June 30, 1941, 10 cases; July 1–12, 1941, 25 cases.
[5] Typhus fever, week ended July 12, 1941, 52 cases, as follows: New York, 1; North Carolina, 2; Georgia, 18; Florida, 5; Alabama, 11; Mississippi, 2; Texas, 13.

PLAGUE INFECTION IN CALIFORNIA

IN FLEAS FROM RATS IN ALAMEDA COUNTY

Under date of July 2, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 23 fleas from 102 rats, *R. norvegicus*, submitted to the laboratory on June 6 from Berkeley, and in a pool of 16 fleas from 4 rats, *R. norvegicus*, submitted to the laboratory on June 13 from Oakland, both in Alameda County, Calif.

IN FLEAS AND GROUND SQUIRRELS IN KERN AND MONTEREY COUNTIES

Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection proved, by animal inoculation and cultures, in ground squirrels, *C. beecheyi*, and in fleas from ground squirrels of the same species, as follows:

Under date of June 30, 1941

In 7 ground squirrels submitted to the laboratory on June 4 from a location in Hunter Liggett Military Reservation 25 miles southwest of King City, Monterey County.

In a ground squirrel submitted to the laboratory on June 5 from a ranch 6 miles south of Davis Ranger Station, Kern County.

Under date of July 5, 1941

In a pool of 9 fleas from 1 ground squirrel found dead on June 6 on a ranch 3 miles south of Davis Ranger Station, Kern County.

In a ground squirrel submitted to the laboratory on June 11 from a ranch 6 miles south of Davis Ranger Station, Kern County.

In 25 ground squirrels submitted to the laboratory on June 5 from a ranch in Hunter Liggett Military Reservation 6 miles west of Jolon, Monterey County.

In a pool of 27 fleas from 4 ground squirrels collected on June 5 on the same ranch, 6 miles west of Jolon, Monterey County.

Collected on a ranch in Hunter Liggett Military Reservation 25 miles southwest of King City, in Monterey County, in a pool of 228 fleas taken on June 3 from ground squirrel burrows; in a pool of 17 fleas from 3 ground squirrels; and in a pool of 103 fleas from 5 ground squirrels submitted to the laboratory on June 4.

Under date of July 2, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in fleas and ground squirrels, *C. beecheyi*, as follows:

In a pool of 24 fleas from 29 ground squirrels submitted to the laboratory on June 9 from San Antone Road, Hunter Liggett Military Reservation, Monterey County.

In a ground squirrel submitted to the laboratory on June 24 from a ranch at Keene, Kern County.

In a pool of 74 fleas from 9 ground squirrels submitted to the laboratory on June 6 from a ranch 6 miles south of Davis Ranger Station, Kern County, and in another pool of 64 fleas from 6 ground squirrels submitted to the laboratory on June 5 from the same ranch.

OUTBREAK OF ENCEPHALITIS IN NORTH DAKOTA

Under date of July 14, 1941, Dr. Maysil M. Williams, State Health Officer, reported an outbreak of encephalitis in North Dakota. To that date a total of 35 cases had been reported this year, of which 25 occurred during the period July 1–12.

Seventeen, or approximately 50 percent, of the cases were reported from Cass County, the other cases being scattered throughout the State. The first case in Cass County was reported on July 1. The first four cases occurring in that county which were investigated, and on which clinical reports were furnished by Dr. Williams, were diagnosed as encephalomyelitis, and in one of these cases there was a definite history of equine encephalomyelitis on the farm where the patient lived, but no history of direct contact. No paralysis was reported in three of these cases but in one ataxia was present in the upper extremities.

Twenty-four of the thirty-five cases were in adults and 11 were in children under 15 years, 4 cases being in infants 1 year of age or younger.

In 1940, 10 cases of encephalitis had been reported in North Dakota up to August 1, and 24 cases, with 11 deaths, were reported for the entire year. For the first 6 months of 1941, approximately 280 cases of encephalitis have been reported in the United States. For the calendar year 1940, a total of 1,217 cases was reported for the country as a whole.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 28, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities											
5-year average	96	28	14	2,192	302	701	8	354	38	1,255	--------
Current week [1]	52	19	11	2,767	261	607	0	352	31	1,295	--------
Maine:											
Portland	0	------	0	0	1	0	0	1	0	7	27
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	6
Manchester	0	------	0	0	0	1	0	0	0	0	14
Nashua	0	------	0	0	0	0	0	0	0	0	6
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	1	126	6	59	0	10	0	33	212
Fall River	2	------	0	5	0	4	0	2	0	5	33
Springfield	0	------	0	59	0	8	0	1	0	4	51
Worcester	0	------	0	11	8	1	0	1	0	4	58
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	0	13
Providence	1	------	0	17	1	5	0	3	0	6	54

[1] Figures for Barre estimated; report not received.

City reports for week ended June 28, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Connecticut:											
Bridgeport	0		0	20	1	5	0	0	0	3	26
Hartford	0		0	7	0	3	0	1	0	1	51
New Haven	0		0	4	1	1	0	0	0	8	30
New York:											
Buffalo	0		1	44	8	16	0	3	0	12	128
New York	13	1	1	346	69	116	0	91	6	92	1,626
Rochester	0		0	107	0	0	0	0	0	9	74
Syracuse	0		0	21	1	4	0	0	1	38	36
New Jersey:											
Camden	1		1	2	1	1	0	2	0	9	27
Newark	0	1	0	40	0	11	0	7	0	23	104
Trenton	0		0	10	2	4	0	1	0	0	34
Pennsylvania:											
Philadelphia	1	2	3	38	7	50	0	21	3	68	506
Pittsburgh	2		0	285	3	11	0	8	0	33	141
Reading	0		0	14	0	1	0	0	0	3	20
Scranton	0			16		0	0		0	0	
Ohio:											
Cincinnati	1		0	7	2	9	0	5	1	7	148
Cleveland	0	3	0	11	0	20	0	9	2	82	176
Columbus	0		0	46	1	4	0	3	0	14	107
Toledo	0		0	269	2	1	0	1	1	28	73
Indiana:											
Anderson	0		0	2	0	0	0	0	0	0	12
Fort Wayne	1		0	1	2	0	0	1	1	0	37
Indianapolis	0		0	62	4	7	0	5	0	8	108
South Bend	0		0	11	0	0	0	0	3	1	15
Terre Haute	0		0	1	2	0	0	0	0	0	19
Illinois:											
Alton	0		0	5	0	0	0	0	1	0	8
Chicago	6		1	64	14	71	0	44	1	47	722
Elgin	0		0	0	0	0	0	0	0	0	13
Moline	0		0	1	0	0	0	0	0	4	15
Springfield	0		0	28	1	2	0	0	0	0	28
Michigan:											
Detroit	2		0	247	11	55	0	6	1	102	267
Flint	0		0	5	3	1	0	0	0	7	29
Grand Rapids	0		0	49	1	4	0	0	1	4	32
Wisconsin:											
Kenosha	0		0	2	0	1	0	0	0	0	13
Madison	0		0	16	0	4	0	0	0	2	8
Milwaukee	0		0	305	5	19	0	2	0	56	89
Racine	0		0	24	0	3	0	0	0	6	13
Superior	0		0	1	0	1	0	0	0	8	13
Minnesota:											
Duluth	0		0	0	0	1	0	0	0	19	19
Minneapolis	0		0	8	2	6	0	0	0	18	104
St. Paul	0		0	0	3	7	0	2	0	23	62
Iowa:											
Cedar Rapids	0			0		1	0		0	0	
Davenport	0			0		0	0		0	0	
Des Moines	0			6		2	0		0	0	36
Sioux City	0			0		0	0		0	17	
Waterloo	1			16		0	0		0	1	
Missouri:											
Kansas City	0		0	45	4	1	0	2	1	9	95
St. Joseph	0		0	2	3	0	0	0	0	0	27
St. Louis	0	1	0	62	4	13	0	18	2	27	255
North Dakota:											
Fargo	0		0	1	3	0	0	0	0	4	6
Grand Forks	0			0		0	0		0	0	
Minot	0			8		0	0		0	0	7
South Dakota:											
Aberdeen	0			1		0	0		0	0	
Sioux Falls	0			0		0	0		0	0	6
Nebraska:											
Lincoln	0			3		1	0		0	3	
Omaha	0		0	2	3	0	0	0	0	0	63
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	0	2
Topeka	2		0	5	1	1	0	0	0	39	15
Wichita	0		0	2	4	0	0	0	0	10	[illegible]

City reports for week ended June 28, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Delaware:											
Wilmington	0	------	0	1	2	0	0	0	0	2	22
Maryland:											
Baltimore	3	------	0	257	8	9	0	7	0	66	218
Cumberland	0	------	0	1	0	0	0	0	0	0	14
Frederick	0	------	0	1	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	1	1	1	80	6	3	0	14	0	9	195
Virginia:											
Lynchburg	0	------	0	42	1	0	0	1	0	6	9
Norfolk	0	------	0	4	2	0	0	1	0	2	21
Richmond	0	------	0	29	3	5	0	1	0	0	48
Roanoke	0	------	0	1	0	0	0	0	0	0	15
West Virginia:											
Charleston	0	------	0	0	3	0	0	3	2	2	31
Huntington	0	------	------	2	------	0	0	------	0	1	------
Wheeling	0	------	0	18	2	0	0	0	0	0	21
North Carolina:											
Gastonia	0	------	------	4	------	0	0	------	0	1	------
Raleigh	0	------	0	4	1	0	0	1	0	9	21
Wilmington	0	------	0	7	1	0	0	0	0	22	6
Winston-Salem	0	------	0	0	1	0	0	1	0	2	11
South Carolina:											
Charleston	0	------	0	1	1	1	0	2	0	2	14
Florence	0	------	0	0	1	0	0	1	0	0	9
Greenville	0	------	0	0	1	0	0	0	0	1	23
Georgia:											
Atlanta	1	------	0	1	1	1	0	3	0	1	80
Brunswick	0	------	0	0	0	0	0	0	0	3	4
Savannah	0	------	0	10	4	1	0	2	1	0	35
Florida:											
Miami	0	------	0	2	1	0	0	1	0	3	29
St. Petersburg	0	------	0	3	0	0	0	0	0	0	10
Tampa	0	------	0	1	1	1	0	1	0	0	22
Kentucky:											
Ashland	1	------	0	0	0	0	0	1	0	0	5
Covington	0	------	0	1	0	1	1	1	0	0	16
Lexington	0	------	0	2	0	0	0	0	0	0	11
Louisville	0	------	0	66	8	10	0	6	0	19	103
Tennessee:											
Knoxville	0	------	0	7	2	1	0	1	0	1	25
Memphis	0	------	2	16	1	2	0	3	0	27	68
Nashville	0	------	0	7	0	4	0	1	0	12	43
Alabama:											
Birmingham	0	1	0	6	1	1	0	3	1	1	59
Mobile	1	------	0	1	2	2	0	1	0	0	28
Montgomery	1	------	------	0	------	1	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	1	0	------	1	0	------
Little Rock	0	------	0	4	0	0	0	1	0	1	19
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	5
New Orleans	0	------	0	1	6	0	0	7	1	13	140
Shreveport	0	------	0	0	4	1	0	1	0	1	40
Oklahoma:											
Oklahoma City	1	------	0	0	2	0	0	2	1	1	46
Tulsa	1	------	0	5	3	0	0	1	1	0	34
Texas:											
Dallas	0	------	0	28	0	6	0	2	1	1	66
Fort Worth	0	------	0	0	3	0	0	0	0	0	34
Galveston	0	------	0	0	2	1	0	0	2	0	20
Houston	2	------	0	1	3	3	0	8	0	7	71
San Antonio	1	3	0	0	6	0	0	7	0	13	76
Montana:											
Billings	0	------	0	0	2	0	0	0	0	0	13
Great Falls	0	------	0	1	1	0	0	0	0	1	9
Helena	0	------	0	0	0	0	0	0	0	1	7
Missoula	0	------	0	0	0	0	0	0	0	0	3
Idaho:											
Boise	0	------	0	0	0	2	0	0	0	1	7
Colorado:											
Colorado Springs	0	------	0	3	1	2	0	1	1	0	8
Denver	4	4	0	52	1	2	0	2	0	137	81
Pueblo	0	------	0	6	1	3	0	0	0	7	9

City reports for week ended June 28, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Arizona:											
Phoenix	0	18		2		0	0		0	0	
Utah:											
Salt Lake City	0		0	8	1	4	0	0	0	7	30
Washington:											
Seattle	3		0	2	2	0	0	4	0	24	86
Spokane	0		0	0	0	2	0	0	0	6	27
Tacoma	0		0	1	2	1	0	2	0	5	39
Oregon:											
Portland	1	1	0	0	2	4	0	1	0	3	8
Salem	0			0		0	0		0	0	
California:											
Los Angeles	2	1	0	27	2	19	0	22	0	26	351
Sacramento	2		0	4	3	1	0	1	0	12	30
San Francisco	0	1	0	1	4	6	0	7	0	19	157

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Worcester	1	1	0
New York:			
New York	8	1	4
Pennsylvania:			
Philadelphia	1	0	0
Ohio:			
Cleveland	1	0	1
Illinois:			
Chicago	1	1	0
Maryland:			
Baltimore	2	0	0
South Carolina:			
Charleston	0	0	1
Georgia.			
Atlanta	0	0	15
Alabama:			
Birmingham	0	0	1
Mobile	0	0	1
Louisiana:			
New Orleans	0	0	1
California:			
Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Columbus, 1. Deaths: New York, 3; Columbus, 1.
Pellagra.—Cases Savannah, 3.
Rabies in man.—Deaths: Memphis, 1.
Typhus fever.—Cases. Miami, 2; Tampa, 2; Mobile 1; Los Angeles, 1. Deaths: Houston, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 14, 1941.—During the week ended June 14, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		2	1	6	5		2	3	2	21
Chickenpox		3		94	239	142	44	79	27	628
Diphtheria		8		23	1	2	1	1		36
Dysentery				1						1
Influenza		8			2		14			24
Measles		2		421	1,000	65	50	86	79	1,703
Mumps		2		140	141	20	28	13	5	349
Pneumonia		1			8		1		4	14
Poliomyelitis					1		2			3
Scarlet fever		25	8	91	171	7	6	20	18	346
Trachoma							2		3	5
Tuberculosis	1	2	6	77	63	2	30	4		185
Typhoid and paratyphoid fever				13	5			1		19
Whooping cough				42	141	2		4	13	202

GUATEMALA

Vital statistics—Year 1940.—The following table shows the numbers of deaths from certain causes in Guatemala for the year 1940:

Cause	Number of deaths	Cause	Number of deaths
Accidents	417	Other diseases of the circulatory system	329
Appendicitis	20	Suicide	8
Cancer	466	Traumatism, accidental	105
Diabetes	23	Tuberculosis	1,386
Diseases of the heart	465		

NOTE.—Estimated population, 1938: 3,044,490.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of June 27, 1941, pages 1347–1349. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Smallpox

Peru.—During the period January 1 to March 31, 1941, 249 cases of smallpox were reported in Peru, by Departments, as follows: Cajamarca, 5; Cuzco, 48; Huancavelica, 7; Junin, 119; Lambayeque, 1; Libertad, 12; Lima, 3; Piura, 14; Puno, 39; Tumbes, 1.

Typhus Fever

Peru.—During the period January 1 to March 31, 1941, 453 cases of typhus fever were reported in Peru, by Departments, as follows: Ancash, 14; Apurimac, 2; Arequipa, 7; Ayacucho, 30; Cuzco, 74; Huancavelica, 2; Junin, 31; Libertad, 6; Lima, 1; Puno, 265; Tacna, 21.

Yellow Fever

Belgian Congo.—Two fatal cases of yellow fever have been reported in Belgian Congo, one of the deaths occurring at Libenge on June 17, the other at Kimvulu on June 21, 1941. The entire population at both places has been vaccinated and strict quarantine measures have been taken.

Peru.—During the period January 1 to March 31, 1941, 5 cases of yellow fever were reported in Junin Department, Peru.

×

Public Health Reports

VOLUME 56 JULY 25, 1941 NUMBER 30

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE * 1798 *

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • JULY 25, 1941 • *No. 30*

A STUDY OF THE RELATIONSHIP OF ORAL *LACTOBACILLUS ACIDOPHILUS* AND SALIVA CHEMISTRY TO DENTAL CARIES[1]

By Francis A. Arnold, Jr., *Passed Assistant Dental Surgeon*, and F. J. McClure, *Associate Pharmacologist, United States Public Health Service*

The observations appearing in this report were made on a group of seventh grade school children living in Arlington County, Virginia, a suburban area of Washington, D. C. A clinical examination of each child's teeth was made in March 1939, and again in March 1940. Saliva samples for *Lactobacillus acidophilus* counts were collected in March 1939, April 1939, October 1939, and March 1940. A specimen of saliva for chemical analysis was collected from each child in October 1939, December 1939, and in March 1940. The saliva samples, each totaling about 20 cc., were collected by paraffin stimulation between the hours of 9:30 and 11:30 a. m. Usually about one-half hour was required for collecting each specimen.

The children in this study represent a sample from a population of better than average economic level. None of these children were given any advice by the examiner concerning their oral hygiene or their dental needs during the period of the study. Their communal water supply is the same as that of the city of Washington (*1*) and, according to Elvove (*2*), is practically free of fluorides.

RESULTS OF THE CLINICAL AND BACTERIOLOGICAL EXAMINATIONS

In order to correlate bacteriological and chemical findings with dental caries, it is essential to know whether or not the individual under observation has active dental caries. At the present time the basis for determining caries activity is repeated clinical examinations, with sufficient time intervening to allow the lesions to progress or new lesions to appear. For this study a group of 127 [2] seventh grade pupils, selected at random, was examined clinically at the beginning

[1] From the Division of Infectious Diseases, National Institute of Health. The clinical and bacteriological examinations were made by Francis A. Arnold, Jr., and the chemical analyses by F. J. McClure.

[2] There were 155 children in the original group in 1939, but, owing to changes in school residence, absences, and sickness, only 127 of these children could be followed through the entire year.

and end of the study year. The average age of this group when the study began was 12.9 years (4 were 11 years old, 71 were 12, 44 were 13, 6 were 14, and 2 were 15). The examination was made with the aid of a mouth mirror and explorer, and took from 10 to 15 minutes for each patient. The child was seated facing a window.

The condition of each tooth was recorded and the approximate size of each carious lesion or filling was drawn on a chart. All pits and fissures were recorded as such. Any area in which the explorer caught and which showed any of the macroscopic signs of dental caries (slight opacity around the edges, a perceptible soft decalcified character, or underlying dark stain) was diagnosed and recorded as dental caries. Teeth thus affected were considered as carious, regardless of the size of the lesion.

The second, or repeat, examination was made by the same examiner (F. A. A., Jr.) under the same conditions as the original examination. The chart for each child was referred to as a guide in the second examination, and any changes in size of lesion, any new lesions, or new fillings were recorded on the original chart.

Table 1 summarizes the conditions as found by the two examinations.

TABLE 1.—*Summary of findings on the permanent teeth of 127 Arlington, Va., school children on 2 examinations 1 year apart*

Item	All permanent teeth				1st permanent molars			
	1939		1940		1939		1940	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Number of children examined	127	100	127	100	127	100	127	100
Children without caries	10	7.9	5	3.9	14	11.0	8	6.3
Children showing caries experience [1]	117	92.1	122	96.1	113	89.0	119	93.7
Number of carious teeth	267		402		98		122	
Number of filled teeth [2]	293		401		228		241	
Number of extractions indicated	4		4		1		2	
Number of extracted teeth	20		25		18		21	
Total number of teeth with caries experience	584		832		345		386	
Number of teeth with caries experience per 100 children	460		655		272		304	
Caries increase per 100 children (1 year)	----------		195		----------		32	

[1] This includes all children whose teeth show any evidence of dental caries, such as carious lesions, fillings, or missing (extracted) teeth.
[2] This includes teeth in which all carious lesions are filled, plus those teeth which have fillings and other unfilled carious lesions.

The study group was divided into four classes according to the amount or degree of dental caries activity. These four classes are defined as follows:

Inactive.—Those cases where neither progression of old lesions nor development of new lesions was observed.

$\pm$*Active.*—Those cases in which progression in size of any lesion was doubtful and no new lesions were found. Also included in this group are those children in whom it was impossible to make a correct diagnosis because of changes occurring during the interim, such as fillings being placed in the original lesions.

$+$*Active.*—Those cases which showed either minor progression of existing lesions or the development of one or two new lesions or both.

$++++$*Active.*—Those cases which represent the rampant type of dental caries activity characterized by either the rapid progression of existing lesions or the development of three or more new lesions or both.

At the end of the second examination and before the dismissal of the child, the degree of caries activity was recorded according to the standards just outlined. Thus the examiner could study the original record of the case and compare it with the conditions noted a year later. This method seemingly offers a relatively accurate estimation of the progress of dental caries for each individual. The results of this classification as regards the 127 children studied were as follows: Inactive, 22; $\pm$active, 23; $+$active, 60; $++++$active, 22.

At least two methods other than the clinical examination have received wide acceptance for diagnosing caries activity (*3, 4*). Both methods depend primarily on the presence of *L. acidophilus* in the mouth. In this study a quantitative estimation of the number of lactobacilli present in the saliva of each child was made at four different times during the study year (March, April, and October 1939, and March 1940). The procedure for the bacteriological examination was as follows:

Each child was given a small piece of paraffin and instructed to chew the paraffin so that it would touch every tooth in the mouth. The stimulated saliva sample was collected in a small sterile bottle. Three to five cubic centimeters of saliva were collected from each individual, approximately 5 minutes being required to collect each sample. The child was then given a small beaker and instructed to continue chewing, the saliva being collected in the individual beaker. This sample of saliva (approximately 20 cc.) was used for chemical analysis.

One cc. of the saliva for bacteriological study was mixed thoroughly with 4 cc. of 1 percent dextrose beef infusion broth. One-tenth cc. of this dilution was placed on Kulp's tomato juice agar pH 5 as modified by Hadley (*3, 5*) and spread over the surface with glass rods. These plates and the broth dilution were incubated for 4 days at 37° C. An estimation of the number of lactobacilli per cc. of saliva was obtained by counting the characteristic colonies on the tomato agar by use of a wide-field microscope and a Frost counting chart.

The counts recorded for each separate examination were classified into the following groups:

0=counts showing no lactobacilli on the agar plate and no gram-positive rods growing in the dextrose broth and those salivas showing negative plate growth and positive broth culture.

± = those counts which showed from 100 to 3,000 lactobacilli per cc. of saliva.
+ = those counts which showed from 3,000 to 30,000 lactobacilli per cc. of saliva.
++++ = those counts which showed 30,000 or more lactobacilli per cc. of saliva.

The results of these counts of lactobacilli, grouped according to the clinical diagnosis of dental caries activity, are shown in table 2.

TABLE 2.—*Counts of L. acidophilus found in four separate samples of saliva from 127 Arlington, Va., school children grouped according to the degree of dental caries activity*

INACTIVE DENTAL CARIES

Case No.	March 1939	April 1939	October 1939	March 1940	Case No.	March 1939	April 1939	October 1939	March 1940
13	0	0	0	0	30	++++	±	±	±
34	0	0	0	0	36	±	0	0	0
38	0	0	0	0	40	0	0	±	±
45	0	0	+	++++	53	0	+	0	±
65	±	(1)	±	±	66	+	+	++++	++++
79	0	0	0	0	82	0	0	0	0
94	0	±	±	±	113	++++	++++	+	+
117	+	++++	+	±	132	0	±	0	+
136	+	++++	+	++++	145	0	0	+	+
148	+	±	±	0	150	++++	++++	++++	++++
151	++++	++++	0	0	155	0	0	0	0

± ACTIVE DENTAL CARIES

Case No.	March 1939	April 1939	October 1939	March 1940	Case No.	March 1939	April 1939	October 1939	March 1940
6	++++	++++	++++	++++	18	±	±	++++	++++
22	+	+	+	+	25	++++	++++	++++	+
27	±	++++	++++	++++	55	+	±	±	±
56	±	++++	++++	+	57	+	++++	±	++++
62	0	0	+	+	73	+	±	±	±
85	±	0	±	0	86	±	±	0	+
87	±	+	±	0	92	0	0	+	+
96	+	+	+	+	101	+	++++	+	0
102	±	+	±	±	110	++++	++++	++++	+
112	++++	++++	++++	++++	128	++++	++++	++++	+
129	±	+	±	+	135	±	0	±	±
69	+	++++	0	±					

+ ACTIVE DENTAL CARIES

Case No.	March 1939	April 1939	October 1939	March 1940	Case No.	March 1939	April 1939	October 1939	March 1940
1	++++	++++	++++	±	3	+	++++	+	+
7	+	+	++++	+	9	++++	++++	++++	±
12	0	0	+	±	16	+	++++	+	+
17	0	++++	++++	++++	20	++++	+	++++	++++
21	++++	++++	++++	++++	28	±	0	++++	++++
29	++++	+	++++	++++	31	++++	++++	++++	+
35	++++	++++	++++	+	37	±	(1)	0	±
39	0	+	++++	+	41	+	+	++++	+
46	++++	++++	++++	++++	47	++++	++++	±	+
49	+	±	++++	++++	50	++++	±	++++	+
51	0	+	+	±	54	++++	++++	++++	+
58	++++	++++	++++	++++	60	+	++++	+	+
61	0	±	0	++++	64	++++	+	++++	+
68	++++	++++	+	++++	71	++++	++++	++++	++++
74	++++	+	++++	++++	77	+	±	±	+
78	++++	++++	++++	++++	83	++++	(1)	++++	++++
89	++++	++++	++++	++++	90	++++	++++	+	+
91	0	++++	++++	++++	93	+	++++	++++	++++
95	+	+	±	++++	97	±	+	+	++++
98	+	++++	++++	++++	99	++++	++++	++++	++++
100	++++	++++	++++	++++	103	±	0	+	++++
104	+	++++	+	++++	105	(1)	0	±	±
106	+	0	0	±	111	+	++++	++++	++++
115	+	++++	+	++++	120	±	0	±	++++
121	++++	++++	++++	++++	122	+	++++	++++	++++

[1] Cases which were absent on day of sampling or cases where mold growth prevented counting the plate

TABLE 2.—*Counts of L. acidophilus found in four separate samples of saliva from 127 Arlington, Va., school children grouped according to the degree of dental caries activity*—Continued

Case No.	March 1939	April 1939	October 1939	March 1940	Case No.	March 1939	April 1939	October 1939	March 1940
125	0	0	0	0	126	+	++++	++++	++++
131	±	±	++++	++++	137	+	0	±	++++
139	0	0	+	++++	141	++++	+	++++	+
143	++++	++++	+	±	153	0	0	±	+
154	+	0	++++	++++	70	++++	++++	++++	++++
++++ ACTIVE DENTAL CARIES									
4	+	+	+	0	8	++++	(1)	++++	++++
10	+	(1)	+	+	11	++++	++++	++++	++++
14	++++	++++	++++	++++	15	++++	++++	++++	++++
19	++++	++++	+	+	26	+	±	+	+
32	++++	++++	++++	++++	33	±	+	+	±
43	0	0	++++	++++	48	+	++++	(1)	++++
52	++++	++++	++++	++++	59	++++	++++	++++	++++
67	++++	++++	++++	++++	75	++++	++++	++++	++++
76	++++	++++	++++	++++	84	++++	++++	++++	++++
116	++++	++++	++++	++++	119	++++	++++	++++	±
123	++++	++++	++++	++++	133	+	++++	+	++++

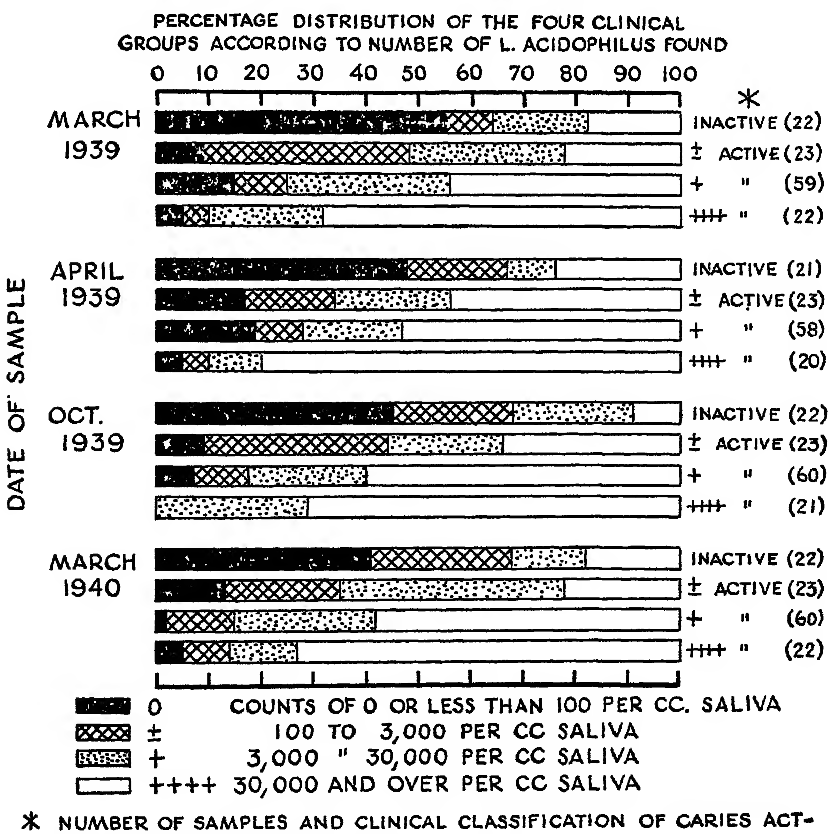


FIGURE 1.—Summary of bacteriological results on 127 school children from Arlington, Va.

A summary of the bacteriological results of the four separate examinations compared with the degree of dental caries activity is shown in table 3.

A graphic representation of the relationship of *L. acidophilus* counts and dental caries activity is presented in figure 1. This graph shows that approximately 50 percent (41–55 percent) of the children with inactive dental caries had less than 100 lactobacilli per cc. of saliva at

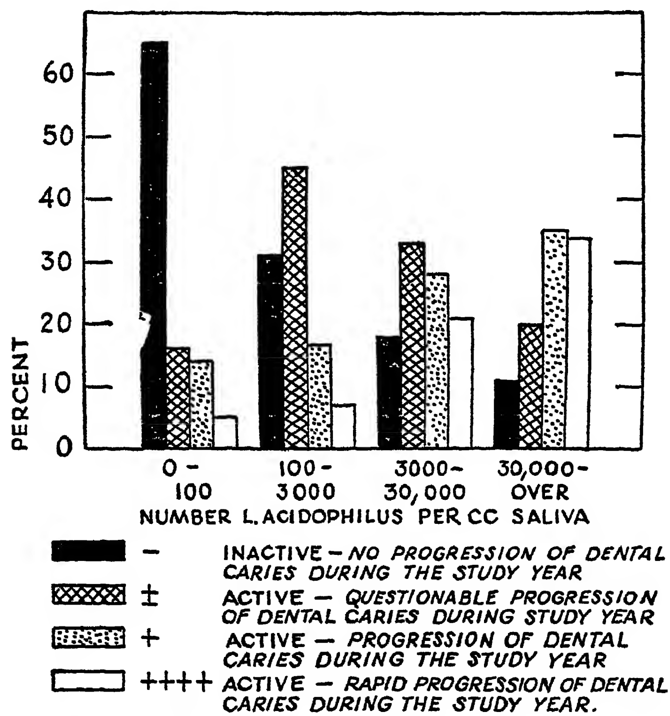


FIGURE 2.—Summary of the clinical classification of dental caries activity observed in 127 Arlington, Va., school children during a 1 year period and its relation to the number of *L. acidophilus* in the saliva noted in 501 estimations made during the study year.

each separate examination. Conversely, only about 5 percent of the children who experienced very active dental caries during the year had counts of less than 100 lactobacilli per cc. of saliva on each examination. In order to show the percentage of the four different clinical classes of dental caries activity occurring in the various bacteriological groups, the percentage distribution of all the bacteria counts is illustrated in figure 2.

TABLE 3.—*A summary of the distribution of L. acidophilus in salivas from 127 Arlington, Va., school children according to the degree of dental caries activity*

Clinical classification according to activity	Number in group	Percentage distribution of the number of *L. acidophilus* according to the degree of dental caries activity [1]							
		March 1939				April 1939			
		0	±	+	++++	0	±	+	++++
Inactive	22	55	9	18	18	48	19	9	24
± Active	23	9	39	30	22	17	17	22	44
+ Active	60	15	10	31	44	19	9	19	53
++++ Active	22	5	5	22	68	5	5	10	80

Clinical classification according to activity	Number in group	Percentage distribution of the number of *L. acidophilus* according to the degree of dental caries activity							
		October 1939				March 1940			
		0	±	+	++++	0	±	+	++++
Inactive	22	45	23	23	9	41	27	14	18
± Active	23	9	35	22	34	13	22	43	22
+ Active	60	7	11	22	60	2	13	27	58
++++ Active	22	0	0	29	71	5	9	13	73

[1] The group classification of the *L. acidophilus* counts and the degree of dental caries activity are defined in the text.

DISCUSSION OF THE CLINICAL AND BACTERIOLOGICAL FINDINGS

Attention is called to certain observations made in the two clinical examinations. This study group is representative of school children who were exposed to an intensive dental health program during their attendance at the Arlington (Va.) schools. A State supervised school dental program has been in operation in this county since about 1922 and has been under the supervision of the same dentist since 1933. The program is planned to take care of all children who present themselves to the school clinic from preschool age up to and including the sixth-grade pupils. A nominal fee for each filling is charged those children able to pay; indigents are treated free of charge. Seventy-one percent of the study group spent their entire school life in the Arlington school system and the remaining 29 percent averaged approximately 3 years' exposure to the school program. It is interesting to note that in 1939 a high percentage (54 percent) of all the teeth showing evidence of dental caries experience had been treated (filled or extracted teeth). In 1940 in the same children 51 percent of the teeth with dental caries experience had evidence of dental treatment. Since the school program does not extend into the seventh grade it may be assumed that these children obtained their dental treatment from private practitioners. Considering the increase in the number of defective teeth, these findings seem to indicate that children accustomed to dental health education and care during grade-school years continue

to have their dental needs supplied by private practitioners after they have passed beyond the age limits of the school dental program.[3]

It appears from the results obtained from the bacteriological studies that there is a close relationship between dental caries activity and the number of lactobacilli present in the mouth. *L. acidophilus* was found to be absent or present in small numbers in the mouths of those children in whom dental caries was inactive. High *L. acidophilus* counts were found in those who had very active dental caries. These findings are in accord with the results reported by other workers (*6, 7, 8*). The consistency of the results obtained on the four separate saliva samples, as shown in table 3 and figure 1, is worthy of note. Such results suggest the possibility of comparing the amount of dental caries activity in group populations by single *L. acidophilus* counts as might be inferred from the observations of Dean, Jay, Arnold, McClure, and Elvove (*9*).

OBSERVATIONS ON PROPERTIES OF SALIVA

The biochemistry of the mixed saliva has long been suspected of having an important relation to the etiology of dental caries. Many analytical data and clinical observations have been accumulated and comparisons made between salivas secreted by groups of caries-free and caries-active individuals. It has been difficult in many instances to attach much significance to the differences reported although it would appear, perhaps, that the calcium, inorganic phosphorus, and carbon dioxide capacity of the saliva may be related to caries susceptibility (*10, 11*).

The results reported in the following discussion include several determinations which have been studied before by other investigators and several factors not previously reported. A summary of the analytical data appears in table 4. The distribution curves shown in figure 3 are based on the averages for the three saliva specimens analyzed.

Total solids, ash, loss on ignition.—The saliva for these three determinations was preserved with thymol and the samples were kept in the refrigerator prior to analysis. A 5 cc. portion was dried to constant weight at 100° C. to obtain the weight of total solids. This dried residue was ashed to constant weight at 600° C. to obtain weight of ash. The loss in weight during ignition represents the organic matter.

[3] It must be noted that the increase in dental caries from 1939 to 1940 is very great. Since the second examination was made using the chart of the original examination it is evident that the increase in the number of carious teeth, many of which are based on subjective assessment, probably results in a high value. The number of filled teeth, however, is based on objective assessment, which will give a truer value for the yearly increase.

TABLE 4.—*Summary of saliva analyses*

	October		December		March		Grand average
	Number	Average	Number	Average	Number	Average	
	Total solids, mg. per 100 cc.						
All samples [1]	128	533.4	116	524.6	126	530.8	528.8
Caries inactive	22	541.7	18	534.2	21	539.8	542.2
Caries active±	22	519.8	19	527.5	23	526.6	522.2
Caries active+	57	539.7	54	523.1	60	537.8	530.5
Caries active++++	21	514.4	21	522.7	22	507.2	512.7
L. acidophilus count:							
0–3,000	40	521.1	----------	----------	36	534.9	540.2
3,000–30,000	25	532.6	----------	----------	27	535.4	506.7
<30,000	65	525.5	----------	----------	63	535.1	520.0
>30,000	63	541.6	----------	----------	63	522.0	535.9
	Loss on ignition (organic matter), mg. per 100 cc.						
All samples	128	303.7	116	296.2	125	318.1	303.5
Caries inactive	22	310.5	18	289.2	22	312.4	306.5
Caries active±	22	295.0	19	302.5	23	306.4	305.1
Caries active+	57	305.5	54	294.9	59	328.6	309.5
Caries active++++	21	296.7	21	299.6	21	306.9	296.5
L. acidophilus count:							
0–3,000	40	293.2	----------	----------	35	319.7	305.2
3,000–30,000	25	299.8	----------	----------	26	319.9	290.1
<30,000	65	295.7	----------	----------	61	319.8	296.1
>30,000	62	307.8	----------	----------	62	321.9	314.3
	Ash, mg. per 100 cc.						
All samples	128	229.7	116	228.4	126	212.9	223.9
Caries inactive	22	231.2	18	245.0	22	213.7	234.4
Caries active ±	22	224.8	19	225.0	23	211.1	223.1
Caries active +	56	230.9	54	229.9	59	211.9	221.3
Caries active ++++	21	217.7	21	223.1	22	202.4	214.4
L. acidolphilus count:							
0–3,000	40	227.9	----------	----------	35	215.2	237.7
3,000–30,000	25	232.8	----------	----------	27	208.3	215.7
<30,000	65	229.8	----------	----------	62	212.2	224.4
>30,000	63	223.0	----------	----------	62	207.1	222.8
	Percent ash in total solids						
All samples	128	43.1	116	43.8	125	40.1	42.4
Caries inactive	22	43.3	18	45.9	21	40.8	43.0
Caries active ±	22	43.1	19	43.0	23	39.7	42.2
Caries active +	57	43.3	54	43.9	59	39.6	42.1
Caries active ++++	21	42.7	21	42.9	22	40.5	42.4
L. acidophilus count:							
0–3,000	40	44.0	----------	----------	35	41.2	43.5
3,000–30,000	25	43.9	----------	----------	27	40.0	43.1
<30,000	65	44.0	----------	----------	62	40.7	43.3
>30,000	63	42.4	----------	----------	62	39.6	41.7

[1] Not all the children were available for the entire year's study and thus the total classified samples do not equal the total samples analyzed for the first two months. In several instances there are differences in actual samples on which chemical data were obtained and in samples on which bacterial counts were obtained.

Table 4.—*Summary of saliva analyses*—Continued

	October		December		March		Grand average
	Number	Average	Number	Average	Number	Average	
	Total nitrogen, mg. per 100 cc.						
All samples	128	49.4	131	47.3	127	48.3	48.5
Caries inactive	22	50.3	21	47.1	22	50.5	49.5
Caries active ±	22	46.9	23	49.4	23	47.9	48.1
Caries active +	57	50.3	67	47.5	60	49.7	49.3
Caries active ++++	21	47.9	22	45.7	22	44.7	45.9
L. acidophilus count:							
0–3,000	41	49.2	----------	----------	36	48.4	49.2
3,000–30,000	24	48.7	----------	----------	27	49.1	46.7
<30,000	65	49.0	----------	----------	63	48.7	47.7
>30,000	63	49.6	----------	----------	63	48.7	49.3
	Percent nitrogen in total solids						
All samples	128	9.3	116	9.0	127	9.1	9.2
Caries inactive	22	9.3	18	8.8	22	9.3	9.1
Caries active ±	21	9.6	19	9.7	23	9.2	9.3
Caries active +	57	9.5	54	9.0	60	9.2	9.2
Caries active ++++	21	9.2	21	8.7	22	8.8	8.9
L. acidophilus count:							
0–3,000	40	9.4	----------	----------	36	9.0	9.1
3,000–30,000	25	9.3	----------	----------	27	9.2	9.3
<30,000	65	9.4	----------	----------	63	9.1	9.2
>30,000	63	9.3	----------	----------	63	9.2	9.1
	Ammonia nitrogen, mg. per 100 cc.						
All samples	127	7.3	130	8.1	123	8.8	8.0
Caries inactive	20	6.9	20	7.9	20	9.1	7.7
Caries active ±	22	7.0	23	8.3	23	8.4	7.7
Caries active +	58	7.4	60	8.2	58	9.3	8.3
Caries active ++++	21	7.4	22	7.8	22	8.1	7.6
L. acidophilus count:							
0–3,000	37	7.2	----------	----------	34	8.1	7.8
3,000–30,000	24	6.9	----------	----------	25	8.8	7.5
<30,000	61	7.1	----------	----------	59	8.4	7.6
>30,000	65	7.5	----------	----------	63	9.3	8.3
	Corrected nitrogen (total nitrogen minus ammonia nitrogen), mg. per 100 cc.						
All samples	127	42.3	130	39.2	126	39.5	40.4
Caries inactive	22	43.7	20	39.3	21	40.4	41.4
Caries active ±	21	41.0	23	43.6	23	40.9	40.6
Caries active +	58	42.9	60	39.2	60	40.4	40.7
Caries active ++++	21	40.5	22	37.7	22	36.1	38.0
L. acidophilus count:							
0–3,000	39	41.3	----------	----------	35	39.6	40.9
3,000–30,000	25	43.1	----------	----------	27	40.4	39.2
<30,000	64	42.0	----------	----------	62	39.9	39.9
>30,000	62	43.3	----------	----------	63	39.3	40.8
	Percent corrected nitrogen in organic matter						
All samples	123	14.3	112	13.8	122	12.4	13.2
Caries inactive	22	14.3	17	13.5	20	12.7	13.6
Caries active ±	19	15.1	17	13.8	20	13.2	13.4
Caries active +	54	14.1	53	13.4	58	12.4	13.3
Caries active ++++	21	13.7	21	12.7	21	12.1	12.9
L. acidophilus count:							
0–3,000	40	14.5	----------	----------	33	12.7	13.7
3,000–30,000	25	14.5	----------	----------	26	12.5	13.5
<30,000	65	14.5	----------	----------	59	12.6	13.6
>30,000	58	13.7	----------	----------	62	12.3	13.1

TABLE 4.—*Summary of saliva analyses*—Continued

	October		December		March		Grand average
	Number	Average	Number	Average	Number	Average	
	pH of isoelectric zone						
All samples	130	2.08	131	2.18	126	2.24	2.30
Caries inactive	22	2.27	21	2.28	22	2.40	2.37
Caries active±	22	2.26	23	2.28	23	2.16	2.34
Caries active+	60	2.00	60	2.14	59	2.26	2.34
Caries active++++	21	1.97	22	2.13	22	2.21	2.37
L. acidophilus count:							
0–3,000	42	2.10	----------	----------	36	2.32	2.31
3,000–30,000	24	2.35	----------	----------	27	2.07	2.24
<30,000	66	2.19	----------	----------	63	2.21	2.26
>30,000	65	1.80	----------	----------	63	2.21	2.27
	Oxygen consumed from potassium permanganate, p. p. m.						
All samples	132	902.0	128	908.0	121	935.0	911.0
Caries inactive	22	846.0	21	866.0	20	946.0	888.0
Caries active±	22	906.0	23	913.0	23	946.0	920.0
Caries active+	60	922.0	59	932.0	57	950.0	933.0
Caries active++++	21	876.0	20	893.0	21	897.0	877.0
L. acidophilus count:							
0–3,000	42	848.0	----------	----------	34	979.0	892.0
3,000–30,000	25	912.0	----------	----------	27	874.0	867.0
<30,000	67	872.0	----------	----------	61	933.0	877.0
>30,000	65	934.0	----------	----------	60	938.0	940.0
	Oxygen consumed (p. p. m.) per mg. organic matter						
All samples	127	3.0	109	3.1	117	2.9	3.0
Caries inactive	22	2.8	18	2.9	20	2.9	2.9
Caries active±	21	3.3	18	3.0	21	2.9	3.0
Caries active+	56	3.0	51	3.2	54	2.5	3.1
Caries active++++	21	3.0	19	3.0	20	2.9	3.0
L. acidophilus count:							
0–3,000	40	2.9	----------	----------	32	3.1	3.0
3,000–30,000	25	3.1	----------	----------	26	2.8	3.1
<30,000	65	3.0	----------	----------	58	3.0	3.1
>30,000	62	3.0	----------	----------	58	2.9	3.0

Total nitrogen.—Total nitrogen was determined on 1 cc. of thymol-preserved saliva, kept in a refrigerator. The usual micro-Kjeldahl method for total nitrogen was followed. Total nitrogen present in the 1 cc. analytical sample averaged approximately 0.40 to 0.50 mg. The method is accurate to about 2 percent.

Ammonia nitrogen.—The formol titration method, used for a rapid clinical estimation of ammonia plus free amino acid nitrogen in urine (*12*), was applied to the determination of ammonia in saliva within a few hours after collection. The specimens of saliva preserved with thymol were kept in a refrigerator. One cc. of this saliva was placed in a small cylindrical vial (approximately 4.5 cm. x 1.4 cm.) and 1 cc. of 10 percent potassium oxalate and 1 drop of phenolphthalein (0.5 gm. phenolphthalein in 50 cc. of alcohol plus 50 cc. of water) were added. This was titrated to a faint pink color with 0.002 N NaOH, followed by the addition of 1 cc. of formol solution (50 cc. of 30 to 40

percent commercial formaldehyde, plus 1 cc. of the phenolphthalein, and made a faint pink color with 0.2 N NaOH). The neutral saliva-formol mixture was then titrated with 0.002 N NaOH.

The method had an average accuracy of about 0.0015 mg. nitrogen. The 1 cc. saliva samples taken for analysis contained on the average from 0.06 to 0.10 mg. of total ammonia nitrogen.

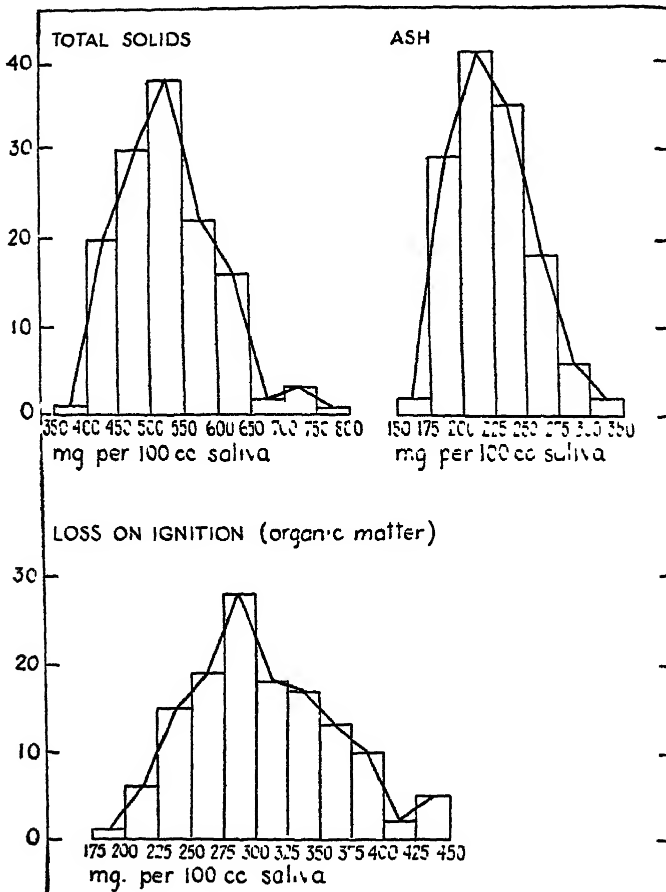
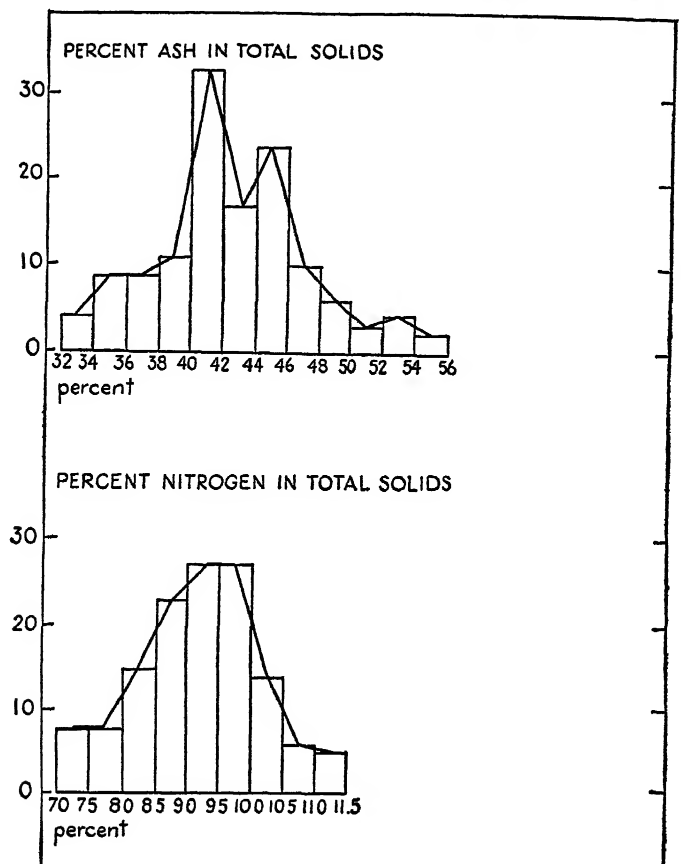


FIGURE 3.—Distribution curves based on average data for the three specimens of saliva obtained from each individual.

It will be noted that in this determination formaldehyde reacts with both ammonia and free amino acid nitrogen. It would appear that amino acid nitrogen is present in saliva in very small amounts, if at all (*13*). This was demonstrated to our satisfaction also by determining ammonia nitrogen in several saliva samples by a method of direct nesslerization (*14*) and comparing these results with the

above formol titration procedure. The two methods agree satisfactorily, as shown by the following data:

Saliva sample	Ammonia nitrogen by—	
	Nesslerization	Formol titration
	Mg. per 100 cc.	*Mg. per 100 cc.*
1	7.1	7.0
2	4.9	5.1
3	7.3	7.3
4	3.9	3.7
5	6 7	6.4
6	6.8	6.2



[FIGURE 3.—Continued.

Our results for ammonia nitrogen found by formol titration are similar to results reported by Youngburg (*15*) who determined ammonia in saliva by alkaline distillation and titration with standard acid. His values range from 1.28 to 13.66 mg. of ammonia nitrogen

per 100 cc. of saliva under normal conditions. Karshan (*16*) studied ammonia nitrogen by a permutit absorption method, and reported values varying from 1.3 to 10.0 mg. of ammonia nitrogen per 100 cc. of saliva. Results reported in this paper vary from 2.0 to 16.0 mg. of ammonia nitrogen per 100 cc. The determination of ammonia in saliva by formol titration is a relatively rapid and simple method and may be applied to a small sample of saliva. It appears to have satis-

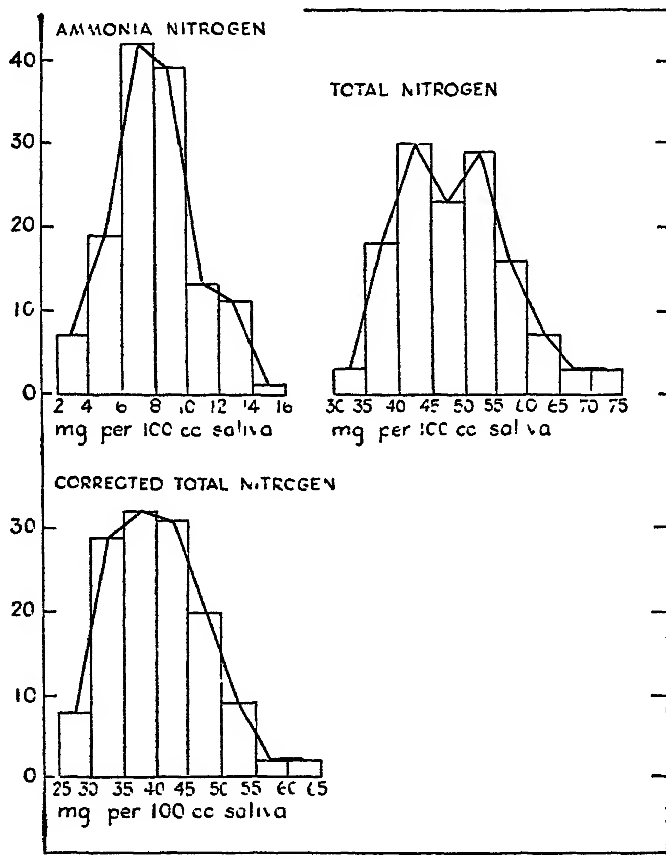


FIGURE 3.—Continued.

factory accuracy for clinical purposes. The wide range in values of ammonia nitrogen is usually accounted for by variable bacterial decomposition of salivary urea (*13*). The presence of thymol and storage of the saliva in the refrigerator were found to prevent any increase in ammonia over a period of 2 to 3 hours, the maximum time our samples stood prior to the ammonia determinations.

Corrected total nitrogen.—This was obtained by subtracting ammonia nitrogen from total nitrogen. Salivary nonprotein nitrogen, as reported by Updegraff and Lewis (*13*), equals about 13.0 mg. of nitro-

gen per 100 cc. This consists of 5.0 to 6.0 mg. of ammonia nitrogen, 4.0 to 5.0 mg. of urea nitrogen, and 1.0 to 1.5 mg. of uric acid nitrogen. Our corrected nitrogen figure represents, therefore, mostly protein nitrogen, but it also includes some urea and uric acid nitrogen. As has been stated, free amino acids, according to the results of Updegraff and Lewis (*13*), are probably not present in saliva.

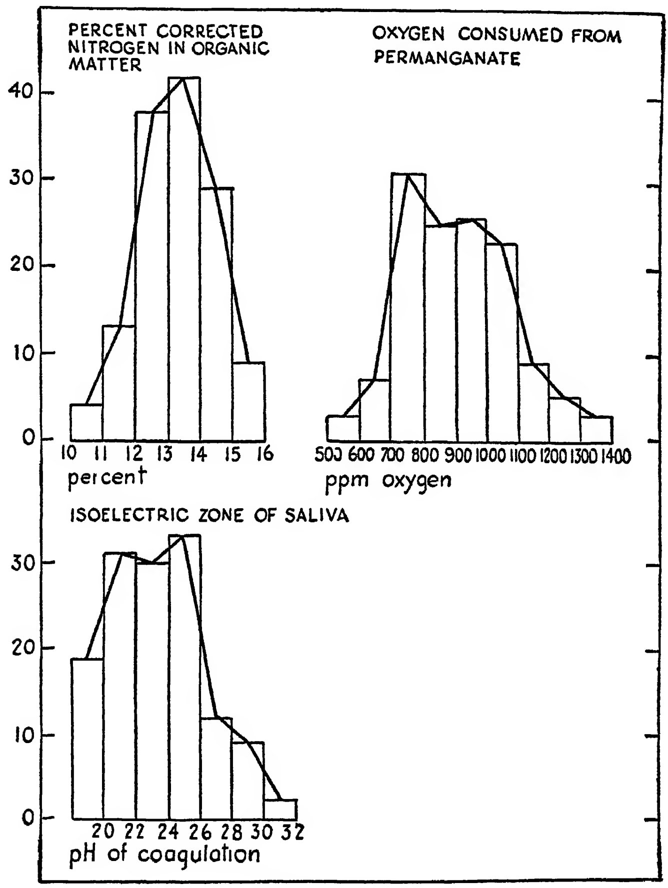


FIGURE 3.—Concluded.

Percent corrected nitrogen in organic matter.—An average of about 13.0 percent of corrected nitrogen was found in organic matter and this represents largely mucin nitrogen (pure salivary mucin contains 10 to 11 percent total nitrogen). It was not converted to total protein since this corrected nitrogen figure includes some urea and uric acid nitrogen.

Percent total nitrogen in total solids.—This figure has only relative value, being calculated solely to differentiate the total solids.

OXYGEN CONSUMED FROM POTASSIUM PERMANGANATE

The sample of fresh saliva as collected was added to a 1:3 dilution of H_2SO_4 (2 cc. of saliva plus 2 cc. of the diluted acid). This sulfuric acid dilution of saliva was tested as follows: In a 250 cc. Erlenmeyer flask were placed 10 cc. of 1:3 H_2SO_4, 70 cc. of water, and 1 cc. of the 1:2 sulfuric acid-diluted saliva. To this was added 20 cc. of standard $KMnO_4$. The flask was placed immediately in a boiling water bath and let stand exactly one-half hour. The flask was removed from the bath, and an excess (20 cc.) of standard ammonium oxalate was added immediately. This solution was then back titrated with the standard $KMnO_4$. The net cc. of $KMnO_4$ used for this back titration represented permanganate reduced by the organic matter in the saliva. This method is modified from a similar procedure applied to sewage and polluted water (*14*). While the results would appear to depend largely on the total organic matter present, there was also the possibility that certain qualitative differences in the saliva organic matter might become apparent from this test. The method is entirely empirical and has only relative value. As carried out it has an accuracy of about ±50 p. p. m. It gave results fairly constant for the same individual's saliva, collected from day to day, as shown by the following data:

Date	Oxygen consumed from permanganate, p. p. m.			
	F. J. M.	C. M.	J. S.	W. T. H.
Sept. 12	1,425	1,050	950	2,420
Sept. 13	1,490	1,280	1,020	2,100
Sept. 14	1,210	1,330	900	1,850
Sept. 15	1,220	1,030	930	2,010

OXYGEN CONSUMED BASED ON TOTAL ORGANIC MATTER

This figure was obtained by dividing the value for oxygen consumed (p. p. m. of oxygen) by the total organic matter (mg. per 100 cc.). It evaluates the oxygen consumption on the basis of organic matter alone, by eliminating variations due to different quantities of organic matter present in the analytical sample.

pH of isoelectric zone.—It has been reported by Inouye (*17*) that the reaction of maximum precipitation of salivary mucin by dilute acid (the isoelectric zone) is pH 2.95 to 2.75. Mucins from different sources may vary in this property. Thus Oldfeldt (*18*) has shown the pH of minimum solubility in citrate buffer of mucins from submaxillary gland, umbilical cord, cornea, and vitreous humor to be, respectively, pH 2.5, 3.8, 3.6, and 3.0. On testing the coagulation of saliva in buffer solutions it was noted that salivas from different

individuals did not all coagulate at the same pH, and this appeared to be a relatively constant characteristic of each individual saliva.

In making this test of saliva coagulation, 1 cc. of fresh saliva is added to 5 cc. quantities of a series of buffer solutions ranging from pH 2.0 to pH 3.8, at 0.2 intervals. The saliva-buffer mixture is whipped up gently with a stirring rod and coagulation is indicated by protein precipitation and collection in clumps on the stirring rod.

Using McIlvanes sodium phosphate-citric acid buffer solutions (*19*), the following are typical results obtained in some preliminary tests:

Date saliva specimen taken	Saliva isoelectric zone, pH			
	F. J. M	W T. H.	J. S.	W. S. M.
Dec 1, a. m	3.0	3.2	2.2	2.2
1, p m	3.1	3.4	2.4	2.4
2, a. m	3.1	3.2	2.6	2.2
Feb. 8, p m	3.1	3.4	2.8	2.4
9, a. m	3.4	3.6	2.6	2.6
13, a. m	3.2	3.3	2.4	2.4

From these results and others obtained in similar tests it appeared worth while to apply this test on a number of salivas to determine the relation, if any, to the condition of the teeth. It should be noted that the pH of coagulation as reported applies to a phosphate-citric acid buffer. Other buffer solutions such as sodium citrate, sodium acetate, lactic acid, and sodium phosphate-lactic acid, were tried and it was found that the pH of coagulation varies slightly with the type of buffer solution used. In obtaining the average figures reported in table 4 samples which did not coagulate at pH 2.0 were credited with a value of 1.0.

DISCUSSION OF RESULTS OF SALIVA ANALYSES

The results of the saliva analyses have been studied by classifications based on the clinical diagnosis of the teeth as well as on the counts of *L. acidophilus* in the saliva. As was pointed out, the degree of caries activity was determined by two examinations made one year apart. The average counts of *L. acidophilus* represent saliva specimens taken at the time of the final clinical examination and twice during the study year. In view of the evidence that there is a direct relationship between caries activity and numbers of *L. acidophilus* in the saliva, the average data resulting from either of these two criteria for classification should be somewhat similar. In general, the data bear out this expectation.

A careful inspection of our analytical data leads to the conclusion that none of the properties of saliva studied has any really significant connection with the individual's caries activity or with the numbers

of *L. acidophilus* in his saliva. As regards total solids, ash, total nitrogen, and ammonia, which have been studied previously by other investigators, this conclusion is in agreement with other published work. Perhaps it may be noted, however, that our results for ash and for percentage of ash in total solids may be indicative of a tendency, at least for the inactive caries groups, to have slightly more ash in their saliva than the more active caries groups. A similar result for ash for a caries-free group is reported by Hubbell (*20*). However, Hubbell did not attach any significance to differences in her data on ash.

It may be noted that loss on ignition, total nitrogen, corrected nitrogen, and oxygen consumed from permanganate are essentially similar measures of the same fraction of the saliva, namely, the organic matter. Results for none of these determinations show any relation to caries activity or *L. acidophilus* counts. The figures for percentage nitrogen in total solids and percentage corrected nitrogen in organic matter are slightly lower in the most active caries groups. However, no real importance may be attached to such small differences between groups.

No observations have appeared in the literature concerning variations in the pH of the isoelectric zone of salivas. Saliva from different individuals may vary in the pH of the isoelectric zone from somewhat less than pH 2.0 to pH 3.2. The observed differences in coagulation which different salivas show when added to buffer solutions are rather striking and interesting. It seemed that this response to acid precipitation, being indicative of qualitative differences in individual saliva protein, might be related to the formation of tooth surface plaques. However, nothing in our work thus far indicates that caries activity is related to this saliva characteristic.

SUMMARY

The dental caries experience rate and the increase in that rate over a period of 1 year has been determined on 127 white school children living in Arlington, Va. The study group was classified according to the degree of dental caries activity during the year. Bacteriological studies of the saliva were made on individuals belonging to the various clinical types. A close correlation was found to exist between dental caries activity, measured by repeated clinical examination, and the number of *L. acidophilus* in the saliva.

Three specimens of stimulated saliva collected at 2- and 3-month intervals from the same 12–14-year-old school children were tested

for the following properties: (*a*) Total solids, (*b*) loss on ignition (organic matter), (*c*) ash, (*d*) percentage ash in total solids, (*e*) total nitrogen, (*f*) percentage nitrogen in total solids, (*g*) ammonia nitrogen, (*h*) total nitrogen minus ammonia nitrogen (corrected nitrogen). (*i*) corrected nitrogen in organic matter, (*j*) pH of isoelectric zone, (*k*) p. p. m. oxygen consumed from permanganate, and (*l*) oxygen consumed from permanganate per mg. of organic matter in saliva.

The data were studied in relation to numbers of *L. acidophilus* in the saliva and to the degree of caries activity as determined by clinical examination. No significant relationship was present.

A method of formol titration for ammonia nitrogen in urine was applied to the determination of ammonia nitrogen in saliva and is reported as a satisfactory rapid clinical method for saliva analysis.

The pH of the isoelectric zone of saliva protein was found to vary among different salivas, but this variation was not correlated with caries activity or with numbers of *L. acidophilus* organisms in the saliva.

ACKNOWLEDGMENTS

The writers wish to express their indebtedness to Professor Fletcher Kemp, superintendent of education of Arlington, Va., Mr. Charles J. Walsh, principal of Thomas Jefferson Junior High School, and Dr. Thomas W. Pumphrey, school dentist of Arlington, Va., for their cooperation in this study.

REFERENCES

(*1*) Lundberg, A. T.: The Arlington County water system. J. Am. Water Works Assoc., **30**: 1938 (1938).
(*2*) Elvove, E.: Personal communication.
(*3*) Hadley, F. P.: A quantitative method for estimating *Bacillus acidophilus* in saliva. J. Dent. Res., **13**: 415 (1933).
(*4*) Fosdick, L. S., Hansen, H. L., and Epple, C.: Enamel decalcification by mouth organisms and dental caries: A suggested test for caries susceptibility. J. Am. Dent. Assoc. and Dent. Cosmos, **24**:1275 (1937).
(*5*) Jay, P.: Lactobacillus acidophilus and dental caries. Am. J. Pub. Health, **28**: 759 (1938).
(*6*) Johnston, M. M., Williams, C. H. M., Anderson, P. G., Drake, T. G. H., Tisdall, F. F., and Kaake, M. J.: Lactobacillus acidophilus in dental caries. J. Am. Dent. Assoc., **23**:1493 (1936).
(*7*) Jay, P., Crowley, M., Hadley, F. P., and Bunting, R. W.: Bacteriologic and immunologic studies on dental caries. J. Am. Dent. Assoc., **20**: 2130 (1933).
(*8*) Enright, J. J., Friesell, H. E., and Trescher, M. O.: Studies of cause and nature of dental caries. J. Dent. Res., **12**: 759 (1932).
(*9*) Dean, H. T., Jay, P., Arnold, F. A., Jr., McClure, F. J., and Elvove, E.: Domestic water and dental caries including certain epidemiological aspects of oral *L. acidophilus*. Pub. Health Rep., **54**:862 (1939).
(*10*) Karshan, M.: Factors in saliva correlated with dental caries. J. Dent. Res., **18**: 395–407 (1939).

(11) Karshan, M.: Dental Science and Dental Art. Edited by S. M. Gordon. Lea and Febiger, Philadelphia, 1938. Chap. IX.
(12) Hawk, P. B., and Bergheim, O.: Practical Physiological Chemistry. 10th ed. Blakiston, Philadelphia, 1931. P. 828.
(13) Updegraff, H., and Lewis, H. B: A quantitative study of some organic constituents of the saliva. J. Biol. Chem., **61**: 633–648 (1924).
(14) Standard Methods for the Examination of Water and Sewage. 8th ed. Am. Pub. Health Assoc., 1936. P. 137.
(15) Youngburg, G. E.: Salivary ammonia and its relation to dental caries. J. Dent. Res., **15**: 247–264 (1935).
(16) Karshan, M.: Factors in human saliva correlated with the presence and activity of dental caries. J. Dent. Res., **15**: 383–393 (1936).
(17) Inouye, J. M.: Biochemical studies of salivary mucin. J. Dent. Res., **10**: 7–21 (1930).
(18) Oldfeldt, Carl-Olof: Physical-chemical investigations on some mucins and mucoids. Zeit. Physiol. Chem., **240**: 249–260 (1936).
(19) Clark, W. M.: The Determination of Hydrogen Ions. 3d ed. Williams and Wilkins, Baltimore, 1928. P. 214.
(20) Hubbell, R. B.: The chemical composition of saliva and blood serum of children in relation to dental caries. Am. J. Phys., **105**: 436–442 (1933).

PROVISIONAL MORTALITY RATES FOR THE FIRST QUARTER OF 1941

The mortality rates in this report are based upon preliminary data for 27 States and the District of Columbia. Comparative data are presented for the same States for the 2 previous years as well as such reports as have been received from five additional States, Alaska, and Hawaii.

This report is made possible through a cooperative arrangement with the respective States, which voluntarily furnish provisional quarterly and annual tabulations of current birth and death records. The reports are analyzed and published by the United States Public Health Service.

Because of lack of uniformity in the method of classifying deaths according to cause, as well as some delay in filing certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.

In the past, these preliminary reports have accurately reflected the trend in mortality rates for the country as a whole. Some deviation from the final figures for individual States may be expected because of the provisional nature of the information. However, it is believed that the trend of mortality within each State is correctly represented. Comparisons of specific causes for different States are subject to error because of differences in tabulation procedure and completeness of reporting. Such comparisons should be based upon the final figures published by the Bureau of the Census.

In spite of a widespread epidemic of influenza which started in late 1940 and continued throughout the first quarter of 1941, the crude death rate from all causes, 12.0 per 1,000 population, was slightly less than the corresponding rate for the first quarter of 1940, 12.2 per 1,000 population, and equalled that for the first quarter of 1939. Seventeen of the 28 States for which records are available reported a lower rate in 1941 than in 1940.

The relative number of deaths attributed to influenza was 35 percent greater than in either of the 2 previous years and was the highest reported since 1937. This increase in the death rate occurred in 26 of the 28 reporting States. Measles as well as influenza was epidemic during the first quarter of 1941. As a result, the death rate from this disease, 1.5 per 100,000 population, was the highest since 1938 and was nearly 4 times last year's rate. Other communicable diseases with a higher death rate during the first quarter of this year than during the first quarter of 1940 are whooping cough and encephalitis.

The death rate from tuberculosis was slightly higher than in 1940 but was still below that in 1939. The increase, although small, was fairly widespread; 16 of the 28 States reported a higher rate in 1941 than in 1940.

The largest relative increase in the death rate from the major causes of death, with the exception of influenza, was in the death rate from automobile accidents. This rate increased 22 percent from that in 1940 and was the highest since 1937. The increase in the number of employed persons during the first quarter of the year undoubtedly has brought about a greater use of automobiles, which may be responsible for part of the increase in the death rate from automobile accidents. The death rate from accidents exclusive of those due to automobiles was slightly less than in 1940.

With the exception of the death rates from heart disease and diarrhea and enteritis, which were slightly higher than in 1940, and the death rate from poliomyelitis, which showed no change, the rates for the remaining causes of death presented in the following table were less than in 1940. In spite of the influenza epidemic the death rate from pneumonia decreased about 8 percent from the previous year's rate and was only three-fourths of the rate in 1939.

Twenty of the 28 States reported a higher birth rate than during the previous year. The reported rate, 17 per 1,000 population, is the highest in recent years.

Provisional mortality from certain causes in the first 3 months of 1941, with comparative provisional data for the corresponding period in preceding years

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1–2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13–22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45–55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis under 2 years (119)	Nephritis, all forms (130–132)	All accidents, including automobile accidents (169–195)	Automobile accidents (170a, b, c)
28 States:[1]																								
1941	12.0	17.0	51	2.9	0.4	0.7	0.4	3.1	0.8	48.4	42.8	1.5	0.3	0.6	121.5	32.7	99.4	349.7	80.7	50.8	3.4	86.4	67.6	22.7
1940	12.2	16.1	52	3.9	.5	.8	.9	1.9	1.2	48.1	31.6	.4	.3	.5	122.3	33.0	104.5	348.1	87.2	54.3	3.3	91.4	65.0	18.6
1939	12.0	16.8	55	4.1	.7	.8	1.1	2.4	1.8	49.2	31.8	1.1	.1	.6	119.8	31.4	97.7	327.6	105.9	50.3	4.5	85.0	63.8	18.3
Industrial policyholders, Metropolitan Life Insurance Co.[2]																								
1941	8.5	-----	-----	-----	.5	-----	.6	1.5	.7	45.3	20.8	.8	-----	-----	106.8	33.5	68.0	[3] 245.5	51.2	-----	[4] 3.3	[5] 59.6	46.8	19.8
1940	8.5	-----	-----	-----	.5	-----	.8	1.5	1.3	45.8	16.0	.4	-----	-----	104.9	33.5	67.1	[3] 238.6	57.0	-----	[4] 3.7	[5] 63.8	44.4	15.8
1939	8.8	-----	-----	-----	.4	-----	1.2	2.3	1.6	47.4	18.7	1.0	-----	-----	101.9	30.1	66.0	[3] 234.6	78.4	-----	[4] 4.9	[5] 58.3	44.2	17.0
Alaska:																								
1941	21.0	29.2	132	7.4	5.4	(6)	(6)	21.7	(6)	498.5	113.8	102.6	5.4	(6)	81.3	5.4	81.3	205.0	146.3	43.8	(6)	43.3	146.3	(6)
1940	19.0	23.4	175	(6)	(6)	(6)	(6)	76.6	(6)	404.8	16.4	136.8	(6)	(6)	82.1	(6)	71.1	180.5	164.1	10.9	10.9	10.9	142.2	(6)
1939	12.5	23.0	44	2.4	(6)	(6)	(6)	5.6	5.6	202.1	(6)	(6)	(6)	5.6	61.8	5.6	41.9	185.4	162.9	22.5	(6)	11.2	123.6	(6)
Colorado:																								
1941	11.5	17.6	58	3.7	1.4	1.1	.7	4.3	.4	58.2	40.7	1.1	1.4	(6)	108.2	13.6	84.3	300.8	93.6	64.3	5.0	88.6	67.5	24.8
1940	12.0	18.7	56	2.3	1.1	1.1	.4	2.9	2.1	48.6	21.3	2.1	1.1	.4	122.9	18.2	91.8	310.1	113.6	66.5	2.9	76.8	71.5	17.9
1939	12.6	18.3	69	5.2	1.1	1.1	1.8	6.2	4.0	52.7	49.1	1.5	(6)	.4	109.4	18.9	102.1	266.3	148.7	61.8	6.2	89.8	69.4	20.0
Connecticut:																								
1941	10.2	11.6	41	4.3	.5	.5	.5	.2	(6)	31.3	14.4	.2	.2	(6)	133.6	40.5	90.8	307.3	50.4	48.5	2.1	79.5	52.5	15.3
1940	11.6	14.0	38	3.0	(6)	.5	(6)	.7	.2	36.2	8.2	.5	(6)	(6)	157.2	21.1	125.0	369.1	73.5	47.7	1.6	70.9	53.8	15.5
1939	11.6	13.6	37	2.8	(6)	(6)	.5	1.9	1.2	39.8	10.7	.7	(6)	(6)	150.7	30.8	99.7	288.1	88.5	50.8	2.4	88.5	57.2	16.0
Delaware:																								
1941	14.1	19.2	49	(6)	(6)	(6)	3.0	7.5	(6)	58.5	36.0	1.5	(6)	(6)	115.5	22.5	126.0	442.5	102.0	52.5	4.5	162.0	61.5	24.0
1940	13.4	16.2	55	3.7	(6)	1.5	3.0	3.0	(6)	16.7	33.1	(6)	(6)	(6)	153.5	46.7	117.4	426.0	91.8	52.7	3.0	133.9	37.6	12.0
1939	13.7	17.5	49	4.4	(6)	(6)	(6)	4.6	3.1	70.6	21.0	(6)	(6)	1.5	116.6	39.9	119.7	415.9	144.3	53.7	6.1	127.4	67.5	29.2

District of Columbia:																								
1941	14.3	26.3	46	3.7	.6	1.8	(6)	1.8	1.2	65.4	13.9	.6	.6	(6)	167.2	32.7	94.5	375.1	128.5	85.4	7.9	110.3	78.2	24.2
1940	14.4	21.4	48	2.0	(6)	.6	.6	3.0	.6	63.3	20.5	(6)	.6	(6)	145.8	39.8	98.8	410.3	131.3	77.1	5.4	138.0	63.3	16.3
1939	14.1	20.9	49	5.4	.6	1.2	(6)	1.9	.6	69.9	21.2	(6)	(6)	.6	159.2	31.8	92.4	399.6	109.8	78.7	7.5	109.9	74.9	18.1
Florida:																								
1941	14.7	18.1	57	5.3	1.2	1.2	(6)	2.1	1.0	51.0	76.2	.2	1.9	.6	101.5	29.6	147.2	392.1	75.7	67.7	5.4	105.0	143.9	45.9
1940	14.9	16.1	60	6.9	.6	.4	.2	1.7	1.3	54.1	69.0	.4	.2	.4	105.6	27.8	139.7	398.0	90.5	74.7	5.0	108.1	107.1	41.4
1939	12.6	15.9	62	6.3	.9	.7	.2	3.1	1.8	52.9	37.9	.7	(6)	.2	93.2	24.5	100.0	286.8	73.3	75.9	10.3	100.2	102.2	41.1
Georgia:[7]																								
1941	10.6	17.9	72	4.1	.4	.2	.4	4.3	1.8	40.6	110.1	.4	.4	(6)	55.1	15.3	100.5	202.5	78.5	36.9	3.3	99.7	67.9	28.1
1940	10.0	16.8	73	5.0	.4	.2	.6	.8	1.8	42.3	35.8	.4	.4	(6)	57.7	12.7	101.6	197.7	112.5	27.9	2.1	82.6	56.7	15.2
1939	9.2	16.6	74	6.8	1.2	.8	.4	3.4	1.0	40.0	38.2	2.0	(6)	(6)	51.4	10.4	76.9	154.2	105.2	40.4	3.8	85.9	47.2	17.7
Hawaii:																								
1941	7.5	22.0	55	1.7	.9	(6)	(6)	1.9	(6)	53.8	3.8	3.8	.9	.9	87.7	12.3	54.7	135.8	55.6	47.2	10.4	59.4	56.6	16.0
1940	7.8	22.0	55	1.7	3.8	1.0	(6)	3.8	2.9	75.1	5.7	(6)	1.9	(6)	66.5	16.2	50.4	133.0	54.2	49.4	5.7	67.5	47.5	8.6
1939	7.8	19.0	62	5.2	3.9	(6)	(6)	2.9	2.9	63.4	4.9	(6)	(6)	(6)	58.5	20.5	42.0	145.4	64.4	62.4	11.7	64.4	48.8	12.7
Idaho:																								
1941	8.6	22.0	43	1.4	.8	1.5	(6)	6.1	(6)	7.6	28.0	(6)	(6)	2.3	83.3	20.5	81.1	223.5	47.0	46.2	1.5	57.6	72.7	18.2
1940	9.3	21.5	38	5.0	(6)	3.1	2.3	(6)	.8	16.0	24.4	1.5	(6)	.8	84.7	17.6	60.3	250.3	53.4	48.1	2.3	61.1	70.2	18.3
1939	10.1	20.6	58	2.3	3.0	3.9	.8	2.3	.8	18.8	27.4	.8	(6)	.8	92.3	25.8	86.0	270.6	103.2	53.2	2.3	50.8	73.5	25.0
Illinois:[7]																								
1941	12.0	14.0	44	3.2	.3	.1	.9	1.4	.7	46.1	20.7	.5	(6)	.4	146.8	33.4	85.5	394.6	71.9	57.9	2.0	101.0	65.2	24.2
1940	12.8	13.3	43	3.6	.2	.2	1.4	.6	1.5	47.5	21.5	.2	.1	.4	144.5	40.9	95.4	410.3	81.1	60.7	1.5	106.8	63.5	22.9
1939	12.5	13.2	49	3.2	(6)	.2	1.7	2.2	2.3	46.7	23.7	.2	.3	.4	140.2	34.6	84.8	399.9	106.0	58.4	1.9	114.2	59.1	22.6
Indiana:																								
1941	12.4	16.7	48	2.9	.5	.7	.7	2.0	1.9	38.9	54.0	.9	.2	.1	122.7	15.8	145.8	310.8	87.2	(6)	1.6	72.9	83.0	36.2
1940	13.1	16.3	46	3.3	.6	.2	2.3	2.8	1.4	40.2	50.8	.1	.2	.7	124.3	19.3	165.7	367.7	90.3	(6)	2.6	94.3	72.0	27.4
1939	13.1	16.1	49	4.2	.4	.6	2.5	1.1	1.9	45.3	70.8	.2	(6)	.7	115.2	21.3	149.8	282.6	142.1	(6)	2.9	69.4	63.2	24.0
Iowa:[7]																								
1941	11.0	(6)	(6)	(6)	.2	.5	.7	1.2	.5	14.3	42.0	.2	(6)	.2	132.3	29.9	111.6	321.1	88.1	46.4	1.0	66.5	55.6	17.7
1940	12.3	16.7	46	2.7	.7	.7	1.0	.2	.5	17.0	46.8	.5	.7	2.4	145.0	30.3	136.9	343.9	68.4	54.5	1.2	50.7	67.7	16.6
1939	11.0	17.6	43	1.5	.7	1.2	1.5	2.2	.5	19.3	31.5	2.4	(6)	1.2	121.9	32.3	117.8	299.1	92.4	60.6	1.7	61.8	65.2	16.1
Kansas:																								
1941	11.9	16.6	47	2.7	(6)	1.3	.2	4.7	.4	25.6	58.5	2.5	(6)	1.1	119.8	30.9	110.0	331.5	67.1	51.9	2.5	115.7	71.1	26.9
1940	11.6	14.3	45	4.4	(6)	1.1	.9	1.6	1.1	24.2	45.4	2.0	(6)	.7	125.0	31.6	111.7	309.9	58.7	59.6	2.0	113.0	70.5	18.7
1939	11.2	14.8	48	4.9	.7	.4	1.3	.4	1.1	25.1	40.2	.2	(6)	1.8	117.1	36.1	93.8	280.5	85.7	54.3	2.9	107.9	92.4	17.5
Kentucky:																								
1941	11.6	17.8	71	5.2	1.0	1.8	1.1	9.6	1.0	75.4	115.9	6.1	1.0	.1	81.2	21.1	110.4	241.2	104.2	40.9	3.5	83.0	64.0	22.4
1940	11.5	18.0	66	5.1	.8	.8	.8	4.1	1.8	73.2	63.6	1.1	1.3	.4	78.6	16.2	118.0	239.9	106.3	50.9	4.2	75.6	73.5	17.9
1939	11.7	21.3	45	4.2	2.0	1.9	1.0	1.9	4.0	66.6	72.0	3.2	.4	1.3	79.8	16.1	104.7	227.0	126.5	48.9	5.5	70.3	62.1	19.8
Maine:																								
1941	14.5	16.8	62	2.3	(6)	.9	.5	2.4	(6)	34.7	59.8	.5	.5	.9	150.1	39.9	132.9	401.7	101.6	56.0	4.7	114.9	73.1	21.8
1940	13.0	16.7	57	5.7	.5	1.9	1.9	2.4	1.4	25.6	22.7	1.4	(6)	.5	135.1	34.6	135.5	395.3	72.5	54.0	7.6	88.6	61.5	19.9
1939	14.3	17.2	67	4.2	2.4	.5	.5	4.8	6.7	34.2	33.2	1.0	(6)	(6)	162.0	30.3	138.6	431.0	115.9	50.0	4.8	82.7	53.9	12.5
Maryland:																								
1941	13.6	17.9	54	1.8	.4	1.3	.2	5.3	(6)	78.0	27.5	(6)	.2	(6)	148.2	38.4	104.3	408.9	97.5	46.6	5.9	135.5	81.0	28.8
1940	14.7	16.8	58	3.7	.7	.4	.7	3.7	.7	90.7	22.7	.2	.4	.2	138.7	41.0	117.8	421.7	117.2	51.5	2.9	172.0	73.1	18.9
1939	13.5	16.5	55	.2.7	.4	1.1	.4	1.3	2.2	75.9	21.6	2.5	(6)	.7	129.6	30.5	115.0	372.3	128.0	49.0	4.0	143.7	68.7	17.5
Michigan:[7]																								
1941	10.9	16.3	49	4.1	(6)	(6)	.8	1.5	.2	34.4	29.3	2.3	.1	.2	113.9	30.9	98.6	331.6	75.5	47.1	3.1	59.2	68.2	30.1
1940	10.6	16.2	53	3.8	.2	.1	1.2	1.2	.6	32.6	8.8	.5	(6)	.2	115.0	29.1	95.0	326.9	68.2	59.7	4.8	54.1	63.3	25.3
1939	11.1	16.7	55	3.8	.5	.4	1.7	1.4	1.1	36.9	17.0	1.2	(6)	.1	119.3	30.5	92.5	314.9	103.1	57.0	4.4	61.1	62.8	19.7

Provisional mortality from certain causes in the first 3 months of 1941, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis under 2 years (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
Montana:																								
1941	10.6	19.9	46	2.2	.7	(6)	1.4	(6)	2.9	48.3	40.7	(6)	1.4	(6)	90.5	14.4	100.2	253.0	67.0	62.7	2.2	55.5	81.4	29.5
1940	10.2	19.8	39	4.3	(6)	1.4	3.6	1.4	.7	43.8	20.8	2.9	(6)	.7	113.5	7.9	97.7	228.4	63.2	67.5	3.6	64.6	66.1	19.4
1939	11.5	18.1	66	4.8	2.2	.7	1.5	8.0	.7	38.6	34.0	8.7	(6)	2.2	111.3	16.0	93.1	254.6	117.1	64.7	5.1	61.8	87.3	18.9
Nebraska:																								
1941	10.7	16.7	44	2.8	.3	.9	(6)	1.9	(6)	16.7	68.5	(6)	.9	.3	131.3	27.3	125.8	253.7	67.5	30.9	.9	73.4	50.8	14.9
1940	10.8	16.4	39	2.4	(6)	.9	1.5	(6)	.9	19.9	38.2	.3	(6)	(6)	134.3	35.2	120.1	272.0	74.4	58.7	.9	60.3	56.0	14.1
1939	10.3	16.7	35	3.1	.9	.6	.9	.6	.9	16.6	37.8	1.2	.3	1.2	110.6	27.7	100.2	203.4	99.0	58.1	1.5	75.0	61.8	13.5
Nevada:																								
1941	11.8	17.2	44	4.2	7.2	(6)	(6)	3.0	(6)	50.4	21.6	(6)	(6)	(6)	125.9	14.4	64.8	316.7	64.8	70.2	(6)	57.6	169.1	79.2
1940	12.1	18.7	39	5.8	(6)	3.6	(6)	(6)	(6)	40.0	10.9	(6)	3.6	(6)	109.0	18.2	79.9	272.5	123.5	76.3	(6)	58.1	123.5	40.0
1939	11.9	17.8	54	2.1	(6)	(6)	(6)	(6)	(6)	52.2	14.9	3.7	(6)	(6)	123.1	3.7	82.1	317.1	156.7	37.3	(6)	67.2	74.6	14.9
New Jersey:																								
1941	12.2	14.3	40	2.2	.1	.3	.2	.8	.1	46.4	14.0	1.0	.1	.3	147.5	41.3	109.4	412.0	74.6	55.1	2.3	90.6	60.2	21.7
1940	11.9	13.4	40	2.4	.3	(6)	1.0	.7	.7	43.2	10.1	.1	.2	.2	140.3	42.8	100.9	403.8	74.3	51.5	2.1	90.8	57.0	16.1
1939	12.1	13.6	47	3.5	.2	.6	1.4	2.2	.7	47.0	14.7	(6)	.2	.7	138.8	40.1	96.5	409.1	92.3	58.7	3.5	82.2	50.4	17.4
New Mexico:																								
1941	11.1	26.7	99	3.1	3.0	(6)	(6)	11.9	3.0	71.3	42.4	17.8	(6)	(6)	60.2	12.6	37.9	134.5	86.9	44.6	8.9	51.3	86.2	39.4
1940	11.3	33.6	76	3.6	2.3	(6)	(6)	6.8	.8	73.0	27.1	(6)	(6)	(6)	51.2	11.3	53.4	123.4	80.5	45.9	7.5	54.2	83.5	34.6
1939	13.5	28.8	125	7.0	.8	2.3	1.5	7.7	7.7	82.1	52.7	1.5	.8	(6)	52.7	8.5	40.3	126.3	185.2	62.8	8.5	58.9	72.8	37.2
New York:																								
1941	12.4	14.6	38	2.1	.1	.6	.5	.9	(6)	48.6	10.9	.5	(6)	1.3	157.7	46.6	80.9	453.8	70.3	56.0	2.8	69.4	55.8	14.8
1940	12.2	14.0	39	3.4	.1	.3	.5	1.3	.1	48.8	6.3	.2	(6)	.9	157.7	45.2	81.3	436.0	67.4	60.3	2.9	73.0	58.2	14.0
1939	12.7	14.4	46	3.2	.2	.7	.8	1.1	.3	52.0	8.8	.5	(6)	.3	157.0	44.7	73.3	435.2	101.2	60.8	5.2	81.2	57.8	13.3
North Carolina:																								
1941	10.2	22.7	72	4.8	.6	.3	.3	5.6	2.7	50.5	75.6	1.9	.3	.2	59.0	15.2	85.9	168.3	100.9	38.8	3.8	92.3	73.8	34.1
1940	10.5	21.4	69	5.8	.7	.6	.4	2.1	4.7	52.7	61.0	.6	.1	.1	57.7	18.0	96.0	158.9	102.3	40.8	5.3	110.4	63.2	23.4
1939	9.6	21.5	65	5.5	.6	.5	.7	7.2	4.6	53.7	34.6	2.9	.1	.3	58.7	14.1	88.0	168.0	103.2	47.0	6.2	87.4	58.9	21.9

North Dakota:																								
1941	8.0	22.7	46	.6	(6)	(6)	.6	1.3	2.5	23.5	21.0	1.3	.6	.6	85.2	17.8	70.6	212.5	43.9	37.5	4.5	39.4	49.0	12.7
1940	8.6	21.3	45	2.1	1.3	(6)	2.5	1.9	2.5	20.1	17.6	.6	(6)	1.9	107.3	28.9	77.2	208.9	50.2	51.4	5.0	42.7	49.6	13.8
1939	9.1	21.4	58	3.8	.6	1.3	3.1	3.1	.6	34.5	33.3	6.9	(6)	1.3	96.3	32.1	78.7	208.9	86.2	50.3	8.8	50.3	32.1	8.2
Ohio:																								
1941	12.2	14.7	46	2.5	.2	.4	.4	2.9	.4	42.0	40.1	1.2	.3	.7	133.3	34.6	111.4	354.0	72.6	53.3	3.6	79.8	85.3	30.5
1940	12.8	15.5	44	3.9	.6	.8	1.0	1.9	.6	43.9	27.9	(6)	.1	.3	139.8	33.5	123.8	362.9	87.5	54.7	3.3	87.6	87.0	25.5
1939	12.8	14.1	55	4.0	.3	.4	2.0	1.2	1.5	46.0	39.4	.2	.1	.9	131.9	33.0	125.4	345.9	110.8	60.8	3.3	88.7	75.4	23.4
Oklahoma:																								
1941	10.2	20.5	58	3.6	.3	.3	.5	4.9	3.7	48.0	71.2	.3	.2	.3	81.1	20.0	87.0	208.7	100.9	45.3	1.9	60.6	58.5	22.8
1940	10.3	18.5	54	3.5	1.2	2.1	.5	1.4	4.8	50.8	54.4	.3	1.7	.3	79.9	19.6	88.2	192.4	102.3	50.1	2.9	63.9	56.7	17.2
1939	10.5	18.8	63	4.1	2.4	.2	1.7	2.1	3.6	46.5	48.2	6.6	.5	.7	77.0	17.3	91.5	182.4	130.5	47.3	4.5	67.0	111.3	24.1
Pennsylvania:																								
1941	12.5	18.7	40	2.3	.2	.3	.4	1.8	.4	43.0	30.3	1.0	.2	.5	122.0	40.9	94.5	409.9	74.7	47.3	3.7	104.3	55.4	15.7
1940	12.8	14.4	54	3.3	.6	1.3	.9	1.2	.8	42.5	27.4	.1	.3	.7	124.9	44.1	96.7	397.6	85.0	53.1	3.9	116.2	53.9	14.0
1939	12.4	16.4	53	3.3	.9	.8	.9	2.2	1.2	42.3	25.8	.2	(9)	.9	128.9	40.2	96.5	380.9	88.0	54.8	4.7	99.7	51.0	13.3
Rhode Island:																								
1941	13.2	14.8	42	1.9	(6)	.6	.6	.6	(6)	46.0	19.1	(6)	(6)	1.1	164.9	49.4	102.7	458.3	92.0	58.3	2.8	125.1	41.9	11.2
1940	12.5	14.3	37	2.4	1.1	1.7	(6)	(6)	.6	35.4	6.7	.6	.6	(6)	153.5	42.7	112.5	422.3	84.3	65.8	.6	110.8	59.6	12.9
1939	12.2	14.5	39	2.8	(6)	1.1	(6)	5.7	(6)	40.7	10.3	(6)	(6)	(6)	142.7	38.4	91.1	420.1	101.3	61.9	5.2	98.6	57.9	13.2
South Carolina: [7]																								
1941	11.2	18.9	100	7.2	(6)	1.0	1.3	6.4	.3	46.0	116.5	1.3	.3	(6)	42.5	17.1	86.3	217.6	109.5	29.9	1.6	85.3	61.1	25.4
1940	11.2	17.1	98	7.7	1.0	(6)	.3	1.9	3.5	46.5	113.1	.3	1.0	(6)	46.8	16.0	108.3	204.7	110.2	33.0	1.0	89.4	77.5	21.7
1939	8.9	16.2	79	7.7	2.6	1.0	.7	7.2	1.6	37.4	42.0	.3	.7	.3	39.7	12.8	94.8	158.0	98.7	13.8	1.3	77.4	55.7	22.6
Tennessee:																								
1941	10.7	15.8	75	3.6	.7	1.8	.3	6.6	1.0	82.2	92.5	3.2	.3	.8	76.3	15.4	79.9	180.3	108.7	41.7	3.8	69.8	54.1	17.2
1940	11.4	15.5	71	5.9	.3	.7	1.0	2.8	1.7	77.4	71.1	1.1	.1	.3	70.3	19.3	95.1	225.7	128.3	49.9	2.2	64.0	63.4	13.2
1939	9.7	14.5	64	5.7	.7	1.1	.4	3.6	2.2	73.2	57.8	2.1	.6	.1	64.4	11.8	77.8	172.6	110.0	53.0	3.4	57.1	52.6	16.3
Utah:																								
1941	8.6	22.7	38	.3	(6)	(6)	(6)	1.5	(6)	13.1	22.6	(6)	(6)	(6)	67.8	21.9	57.6	288.1	41.6	54.0	6.6	52.5	60.5	23.3
1940	8.9	23.2	41	2.8	(6)	.7	2.9	1.5	(6)	17.5	23.3	2.2	.7	.7	90.4	15.3	65.6	254.5	48.1	45.9	2.2	59.1	65.6	27.0
1939	8.8	23.2	49	3.2	(6)	2.2	(6)	(6)	(6)	20.8	13.4	(6)	(6)	.7	89.7	14.1	40.8	250.6	69.0	63.0	.7	66.0	54.9	19.3
Vermont:																								
1941	12.9	17.6	51	4.5	(6)	2.3	(6)	(6)	(6)	49.6	44.0	(6)	(6)	(6)	155.7	31.6	137.6	435.5	80.1	55.3	6.8	106.0	60.9	11.3
1940	11.9	18.5	42	1.8	1.1	1.1	(6)	2.2	(6)	41.4	28.0	(6)	(6)	(6)	125.4	21.3	135.5	371.7	91.0	35.8	4.5	87.3	82.8	9.0
1939	13.4	15.7	37	5.0	(6)	1.1	1.1	5.6	1.1	40.7	41.8	(6)	(6)	1.1	151.4	37.3	151.4	307.0	158.1	48.0	5.6	83.0	70.0	22.6
Virginia:																								
1941	13.1	18.7	87	4.0	.7	1.0	.3	9.0	1.3	66.3	85.3	6.6	.3	(6)	83.3	21.4	116.5	290.8	106.7	41.9	3.4	117.9	86.5	30.5
1940	12.9	18.0	78	4.6	.6	1.6	.4	5.1	2.5	59.2	65.9	.7	.3	.9	78.8	24.1	115.8	296.2	125.9	41.8	4.2	123.2	77.9	21.7
1939	12.0	17.7	77	6.6	.3	1.7	.5	6.3	3.8	64.4	49.1	.5	.2	.5	76.6	21.1	116.8	263.3	116.0	41.7	2.1	93.1	67.3	22.0
Wyoming:																								
1941	8.9	16.9	62	4.7	(6)	1.6	(6)	(6)	6.4	16.0	54.3	3.2	(6)	3.2	68.6	16.0	78.2	218.6	57.5	39.0	1.6	63.0	70.2	30.3
1940	8.1	16.5	41	5.8	(6)	3.2	(6)	(6)	3.2	12.8	12.8	(6)	1.6	1.6	76.8	16.0	78.4	201.6	36.8	49.6	1.6	65.6	78.4	38.1
1939	9.4	18.3	50	3.6	1.6	(6)	(6)	1.6	3.3	19.6	24.5	1.6	(6)	(6)	84.8	14.7	73.4	239.7	81.5	47.3	1.6	79.9	79.9	17.9

[1] Includes all States with data for the 3-month period of 1941, 1940, and 1939. The District of Columbia is included as a State. Estimated population July 1, 1941, 68,609,800.

[2] These data are taken from the April 1941 and April 1940 Statistical Bulletins published by the Metropolitan Life Insurance Co. All figures are provisional and are subject to correction, since they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.

[3] Excludes pericarditis, acute endocarditis, and acute myocarditis.

[4] Classified as diarrhea and enteritis, age not specified.

[5] Chronic nephritis only.

[6] No deaths reported.

[7] January and February only.

[8] Data not available.

[9] Less than 0.1 per 100,000 population.

PLAGUE INFECTION IN NORTH DAKOTA AND CANADA

Under date of July 12, 1941, Dr. N. E. Wayson, Medical Officer in Charge of Plague Suppressive Measures on the Pacific coast, reported that plague infection had been demonstrated in fleas collected on June 23, 1941, from ground squirrels shot in North Dakota. This is the first recorded evidence of plague infection in that State, and the locality of occurrence is believed to be the farthest east that so-called sylvatic plague, that is, plague in wild rodents or their ectoparasites, has been recorded in the United States. In May 1939, plague infection was proved in tissue from a kangaroo rat trapped 10 miles west of Las Cruces, Dona Ana County, New Mexico, which was farther south and east than any other area in which plague in wild rodents had been demonstrated to exist in the United States prior to that date. This was also believed to be the first instance of the proof of plague infection among kangaroo rats in this country.[1]

On July 14, 1941, Dr. R. E. Wodehouse, Deputy Minister of the Department of Pensions and National Health of Canada, reported that plague infection had been proved bacteriologically in a ground squirrel taken southeast of Stanmore, Alberta, about 180 miles north of the international boundary. This locality is near that in which an epizootic in ground squirrels occurred during the summer of 1939 and the plague organism was demonstrated in one of the dead squirrels.

In 1938 a survey was made jointly by the Dominion Department of Pensions and National Health and the Health Departments of Alberta and British Columbia.[2] In that survey, 3,569 wild rodents and 7,582 fleas were examined and no evidence of plague infection was found. During the epizootic among squirrels in southeastern Alberta in August of 1939, however, plague infection was demonstrated in the tissue of a Richardson squirrel found dead and 2 fleas recovered from the same squirrel were also found to be infected.

Investigations were continued in the same locality during the following spring, when 5 out of 80 pools of fleas and 1 out of 60 tissue specimens were proved positive for plague. The area of demonstrated infection was reported to cover at least 144 square miles.

Before the discovery of plague infection in wild rodents in the Province of Alberta in 1939, there had been a death, which in retrospect was suspicious of plague and was believed to have been contracted from infected mink.[1] This fatal case occurred in a farmer, aged 35, who raised mink. The animals had been healthy until the owner started feeding them ground squirrels from a locality later proved to harbor rodent plague infection. Several of the animals

[1] Pub. Health Rep., May 19, 1939, p. 850.

[2] Plague surveys in Western Canada. By R. J. Gibbons and F. A. Humphreys. Canadian Public Health Journal, January 1941, pp. 24–28.

became ill and died. While skinning one of the dead minkt he, farmer scratched his hand with a knife. While the diagnosis at the time of death was acute septicemia, the recorded clinical symptoms and the other circumstances mentioned indicate that death was due to plague infection of which ground squirrels were the original source.

Further investigations are being conducted by both Canadian and United States Public Health Service officers in the border areas concerned. A field unit of the Public Health Service is making a survey in North Dakota in the areas adjacent to the locality where the infection was found in squirrel fleas. The early hibernation of the squirrels in this locality, however, may prevent a thorough search this year.

TULAREMIA INFECTION FOUND IN FLEAS FROM PRAIRIE DOGS IN WYOMING

Under date of July 10, 1941, Dr. N. E. Wayson reported that the plague laboratory in San Francisco had found tularemia infection in a pool of 43 fleas taken from 24 prairie dogs (*Cynomys leucurus leucurus*) in Wyoming. The prairie dogs were killed on June 14, 1941, on a ranch 9 miles east and 4 miles south of Parco, Carbon County, and infection was demonstrated in the laboratory by the injection of the fleas in guinea pigs.

The fact that this is the first instance at this laboratory in which tularemia has been produced in guinea pigs by the injection of infected fleas emphasizes the inefficiency of the flea as a transmitter of tularemia infection as compared with its efficiency in harboring and transmitting the plague organism. It is believed that the only other recorded instances of the demonstration of tularemia infection in fleas collected in nature in the United States were those reported by Dr. R. G. Green and Dr. J. E. Shillinger in Minnesota, as follows:[1]

In July 1933, in a single flea from a cottontail rabbit found dead in an area where an epizootic of tularemia among rabbits had been observed. This is believed to be the first reported instance of the infection being found in fleas in the United States.

In October 1933, in a pool of 9 fleas from another cottontail rabbit found dead.

In May 1934, in a pool of 3 fleas from a cottontail rabbit.

In April 1935, in 4 fleas from a hare (snowshoe rabbit), believed to be the first demonstration of tularemia infection in fleas from this species in the United States.

Naturally infected fleas have been reported in Russia by N. G. Olsoufjev.[2]

---

[1] Minnesota Wild Life Disease Investigation, July 1933, October 1933, May 1934, and April 1935. (A mimeographed publication issued by the Bureau of Biological Survey, U. S. Department of Agriculture.)

[2] Résumé of Researches upon Transmitters of Tularemia in the U. S. S. R. Works of All-Union Congress of Microbiologists, Epidemiologists and Infectionists, 1939, Moscow, 1940.

DEATHS DURING WEEK ENDED JULY 12, 1941

[From the Weekly Mortality Index, Issued by the Bureau of the Census, Department of Commerce]

	Week ended July 12, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,985	7,927
Average for 3 prior years	7,769	
Total deaths, first 28 weeks of year	246,751	246,399
Deaths per 1,000 population, first 28 weeks of year, annual rate	12.3	12.3
Deaths under 1 year of age	590	448
Average for 3 prior years	477	
Deaths under 1 year of age, first 28 weeks of year	14,709	14,117
Data from industrial insurance companies:		
Policies in force	64,375,458	65,102,755
Number of death claims	11,583	11,048
Death claims per 1,000 policies in force, annual rate	9.4	8.9
Death claims per 1,000 policies, first 28 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 19, 1941

Summary

The incidence of poliomyelitis increased sharply for the second successive week. A total of 246 cases was reported for the current week, as compared with 187 for last week and with 82 for the next preceding week. For the past 2 weeks the incidence has been considerably above the 5-year (1936–40) median.

The South Atlantic and East South Central States reported 202, or 82 percent, of the total number of cases. The only States reporting more than 6 cases are as follows, with last week's figures in parentheses: Georgia 91 (40); Alabama 46 (40); Florida 13 (11); Tennessee 12 (5); Mississippi 12 (2); North Carolina 8 (0); South Carolina 13 (9). No cases were reported in the New Englnd States and only 1 case in the Pacific States (California). Information regarding local distribution for the current week is not available, except that 19 cases were reported in Atlanta, Ga., and 15 cases in Birmingham, Ala.

A total of 1,223 cases of poliomyelitis has been reported this year to date, a larger number than for the same period of any of the past 5 years, with the exception of 1937 (1,670 cases). The largest number of cases for an entire year during that period was reported in 1940 (9,799), and 94 percent of these cases occurred after July 1.

For the current week 31 cases of encephalitis were reported in North Dakota.

Of 18 cases of Rocky Mountain spotted fever, 11 cases occurred in the Mountain and Pacific areas and 7 in the eastern States. The number of cases of endemic typhus fever increased from 52 to 61, of which 20 cases were reported in Texas, 16 in Georgia, 11 in Florida, and 9 in Louisiana.

The death rate for the current week in 87 large cities in the United States was 10.1 per 1,000 population, as compared with 11.1 for the preceding week and with a 3-year (1938–40) average of 10.2.

Telegraphic morbidity reports from State health officers for the week ended July 19, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred

Division and State	Diphtheria: Week ended July 19, 1941	Diphtheria: Week ended July 20, 1940	Diphtheria: Median 1936-40	Influenza: Week ended July 19, 1941	Influenza: Week ended July 20, 1940	Influenza: Median 1936-40	Measles: Week ended July 19, 1941	Measles: Week ended July 20, 1940	Measles: Median 1936-40	Meningitis, meningococcus: Week ended July 19, 1941	Meningitis, meningococcus: Week ended July 20, 1940	Meningitis, meningococcus: Median 1936-40
NEW ENG.												
Maine	0	2	1	------	------	------	68	93	25	0	1	0
New Hampshire	0	0	0	------	------	------	6	2	2	0	0	0
Vermont	0	0	0	------	------	------	25	12	13	0	0	0
Massachusetts	1	2	5	------	------	------	307	605	207	0	0	0
Rhode Island	1	0	0	------	------	------	13	41	19	0	1	0
Connecticut	3	0	1	2	------	1	117	36	36	0	0	0
MID. ATL.												
New York	11	5	11	[1] 1	------	[1] 3	491	486	491	4	3	4
New Jersey	3	6	6	------	1	2	251	273	171	0	1	1
Pennsylvania	2	3	13	------	------	------	679	201	275	2	2	2
E. NO. CEN.												
Ohio	7	3	8	5	4	3	250	21	58	0	1	1
Indiana	2	4	4	13	3	8	23	4	8	2	2	1
Illinois	15	14	18	7	4	4	106	123	58	1	0	2
Michigan [2]	3	3	10	1	------	------	253	241	115	0	2	1
Wisconsin	1	2	2	9	6	6	373	390	124	0	0	0
W. NO. CEN.												
Minnesota	1	1	1	2	1	1	6	23	23	0	1	0
Iowa	1	0	1	1	2	------	81	53	41	0	1	1
Missouri	3	4	5	------	------	1	49	11	10	0	0	0
North Dakota [3]	1	0	0	------	------	------	8	0	2	0	0	0
South Dakota	5	1	0	------	------	------	2	3	1	1	0	0
Nebraska	0	0	1	3	------	------	7	3	3	0	0	0
Kansas	1	4	2	1	------	1	44	41	17	0	0	1
SO. ATL.												
Delaware	0	0	0	------	------	------	4	0	3	0	0	0
Maryland [2,4]	0	1	5	1	2	2	181	5	13	5	0	2
Dist. of Col.	0	2	3	------	------	------	30	1	14	0	0	0
Virginia [4]	1	13	8	36	17	------	182	45	47	0	5	4
West Virginia [2,4]	1	3	3	4	1	9	171	6	6	0	0	1
North Carolina	7	1	11	1	------	------	170	51	51	0	0	1
South Carolina [5]	3	3	3	78	46	46	116	3	3	0	1	1
Georgia [4,5]	3	1	7	11	9	------	73	9	0	1	0	1
Florida [5]	3	0	2	9	------	1	6	10	7	0	0	0
E. SO. CEN.												
Kentucky	4	3	2	------	------	------	49	24	24	2	2	2
Tennessee [4]	0	1	2	12	4	14	67	25	25	0	0	2
Alabama [5]	3	5	8	3	14	9	41	76	6	3	4	2
Mississippi [2,5]	1	1	7	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	3	3	3	15	1	3	57	5	6	2	0	0
Louisiana [5]	5	2	7	1	4	6	1	3	3	1	0	1
Oklahoma	2	3	3	16	2	5	11	6	6	0	1	1
Texas [5]	7	12	21	253	56	39	80	118	55	1	1	1
MOUNTAIN												
Montana [4]	2	2	0	1	1	------	6	7	7	0	2	0
Idaho [4]	0	0	0	------	------	------	2	3	9	0	0	1
Wyoming [4]	0	0	0	------	1	------	3	2	4	0	0	0
Colorado	11	10	4	5	8	------	24	29	20	0	0	0
New Mexico	1	0	1	------	2	------	17	21	8	0	0	0
Arizona	0	6	1	25	25	11	49	14	14	1	1	0
Utah [2]	0	0	0	2	------	------	8	37	37	0	0	0
Nevada	0	------	------	------	------	------	1	------	------	0	------	------
PACIFIC												
Washington [4]	0	1	1	------	------	------	8	22	24	0	1	0
Oregon [4]	0	0	2	1	------	7	80	38	8	0	0	0
California	13	15	18	30	11	11	146	91	277	0	1	2
Total	131	142	281	549	220	238	4,648	3,313	2,801	26	34	45
29 weeks	6,982	8,192	12,525	597,090	167,533	150,548	821,675	220,680	265,634	1,301	1,060	2,008

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 19, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40	Week ended		Median, 1936–40
	July 19, 1941	July 20, 1940		July 19, 1941	July 20, 1940		July 19, 1941	July 19, 1940		July 19, 1941	July 20, 1940	
NEW ENG.												
Maine	0	0	0	6	5	5	0	0	0	1	0	1
New Hampshire	0	0	0	3	3	1	0	0	0	0	0	0
Vermont	0	0	0	1	4	3	0	0	0	0	0	0
Massachusetts	0	1	1	37	29	38	0	0	0	0	1	2
Rhode Island	0	0	0	5	2	8	0	0	0	0	0	0
Connecticut	0	1	1	10	12	12	0	0	0	1	2	1
MID. ATL.												
New York	6	4	4	90	134	84	0	0	0	33	14	11
New Jersey	5	0	0	44	55	24	0	0	0	5	5	5
Pennsylvania	6	1	1	43	101	101	0	0	0	6	15	15
E. NO. CEN.												
Ohio	0	1	2	51	80	40	0	0	1	8	3	9
Indiana	2	1	1	9	30	26	0	2	4	2	7	9
Illinois	5	1	2	59	100	100	1	1	10	8	15	15
Michigan [1]	6	8	6	79	61	81	1	0	1	17	3	3
Wisconsin	0	5	0	29	38	43	2	2	2	0	0	0
W. NO. CEN.												
Minnesota	1	0	0	27	17	21	0	7	7	0	0	1
Iowa	4	6	1	13	12	13	0	3	9	8	2	3
Missouri	0	1	1	12	21	21	4	1	3	4	12	21
North Dakota [3]	1	0	0	0	4	4	0	3	4	0	0	0
South Dakota	1	0	0	6	5	8	0	3	3	0	0	0
Nebraska	0	2	1	10	3	3	0	0	1	0	0	0
Kansas	0	8	0	9	20	20	0	0	0	1	6	6
SO. ATL.												
Delaware	0	0	0	0	0	1	0	0	0	0	1	1
Maryland [2,4]	4	1	0	14	9	9	0	0	0	20	3	7
Dist. of Col.	1	0	0	1	4	3	0	0	0	0	0	2
Virginia [4]	2	2	2	3	12	12	0	0	0	7	4	16
West Virginia [2,4]	0	4	1	15	18	13	0	0	0	4	3	8
North Carolina	8	1	2	7	11	11	0	0	0	6	12	25
South Carolina [5]	9	0	0	2	2	2	0	0	0	12	15	15
Georgia [4,5]	91	1	2	11	8	8	0	0	0	23	24	41
Florida [5]	13	0	0	3	0	3	0	0	0	1	4	5
E. SO. CEN.												
Kentucky	4	4	2	15	18	13	0	0	0	8	11	30
Tennessee [4]	12	1	2	11	10	10	0	0	0	14	11	33
Alabama [4]	46	5	1	8	6	6	0	1	0	6	8	12
Mississippi [2,5]	12	1	3	1	5	5	0	0	0	7	6	12
W. SO. CEN.												
Arkansas	1	0	0	4	2	2	1	0	0	14	53	26
Louisiana [5]	2	7	3	8	1	3	0	0	0	13	28	28
Oklahoma	0	2	0	13	5	11	1	0	0	8	9	24
Texas [5]	1	8	7	10	17	23	0	0	1	27	43	52
MOUNTAIN												
Montana [4]	1	4	0	10	6	6	0	0	2	0	0	0
Idaho [4]	0	1	0	2	2	3	0	0	2	0	3	1
Wyoming [4]	0	0	0	2	1	1	0	0	0	0	0	0
Colorado	0	0	0	8	9	9	0	3	1	4	2	2
New Mexico	1	1	1	1	3	7	0	0	0	7	2	3
Arizona	0	0	0	0	4	3	1	1	1	0	5	2
Utah [2]	0	1	0	4	6	9	0	0	0	1	2	0
Nevada	0	----	----	0	----	----	0	----	----	0	----	----
PACIFIC												
Washington [4]	0	18	0	11	14	14	0	0	0	1	1	2
Oregon [4]	0	2	0	1	13	10	0	1	2	4	4	3
California	1	15	15	42	38	68	1	1	1	10	6	7
Total	246	119	119	750	960	960	12	29	78	291	345	464
29 weeks	[6] 1,223	1,067	1,067	89,407	116,252	133,844	1,161	1,872	7,693	3,235	3,444	5,065

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 19, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended July 19, 1941	Whooping cough, Week ended July 20, 1940
NEW ENG.		
Maine	28	32
New Hampshire	7	0
Vermont	0	8
Massachusetts	172	132
Rhode Island	28	5
Connecticut	38	45
MID. ATL.		
New York	291	205
New Jersey	118	79
Pennsylvania	336	399
E. NO. CEN.		
Ohio	337	387
Indiana	14	30
Illinois	155	126
Michigan [2]	302	235
Wisconsin	161	83
W. NO. CEN.		
Minnesota	92	34
Iowa	45	27
Missouri	56	69
North Dakota [3]	19	10
South Dakota	10	10
Nebraska	13	7
Kansas	147	53
SO. ATL.		
Delaware	5	12
Maryland [2 4]	103	163
Dist. of Col.	9	5
Virginia [4]	101	36
West Virginia [2 4]	38	51
North Carolina	297	146
SO. ATL.—continued		
South Carolina [5]	106	11
Georgia [4 5]	46	40
Florida [5]	4	7
E. SO. CEN.		
Kentucky	49	83
Tennessee [4]	39	48
Alabama [5]	23	21
Mississippi [4 5]	----------	----------
W. SO. CEN.		
Arkansas	23	47
Louisiana [5]	43	4
Oklahoma	38	19
Texas [5]	203	253
MOUNTAIN		
Montana [4]	35	3
Idaho [4]	26	3
Wyoming [4]	15	9
Colorado	165	15
New Mexico	37	38
Arizona	24	13
Utah [2]	112	87
Nevada	9	----------
PACIFIC		
Washington [4]	110	45
Oregon [4]	46	19
California	408	276
Total	4,486	3,430
29 weeks	131,783	93,431

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Encephalitis, week ended July 19, 1941: North Dakota, 31.
[4] Rocky Mountain spotted fever, week ended July 19, 1941, 18 cases as follows: Maryland, 2; Virginia, 2; West Virginia, 1; Georgia, 1; Tennessee, 1; Montana, 3; Idaho, 1; Wyoming, 3; Washington, 2; Oregon, 2.
[5] Typhus fever, week ended July 19, 1941, 61 cases as follows: South Carolina, 3; Georgia, 16; Florida, 11; Alabama, 1; Mississippi, 1; Louisiana, 9; Texas, 20.
[6] Information has been received that the report of 6 cases of poliomyelitis in Michigan for the week ended May 3, 1941, Public Health Reports of May 9, p. 1031, was an error, no cases having occurred.
[7] Delayed report of 6 cases included.

PLAGUE INFECTION IN CALIFORNIA

Plague infection, proved by animal inoculation and cultures, in ground squirrels and parasites from ground squirrels, *C. beecheyi*, submitted to the laboratory on June 4, 19, 24, 28, and 30, 1941, has been reported by Dr. Bertram P. Brown, State Director of Public Health of California, as follows:

Under date of July 9

IN FLEAS FROM GROUND SQUIRRELS IN SANTA CRUZ COUNTY

In a pool of 241 fleas from 9 ground squirrels from a ranch 6 miles east of Watsonville.

IN GROUND SQUIRRELS AND IN FLEAS AND TICKS FROM GROUND SQUIRRELS IN KERN COUNTY

In a pool of 89 fleas from 6 ground squirrels from a ranch 6 miles south of Davis Ranger Station.

In a pool of 69 fleas from 15 ground squirrels from a ranch 2 miles south of Davis Ranger Station.

In 3 ground squirrels, submitted June 25, in a pool of 36 ticks from 25 ground squirrels, and in a pool of 764 fleas from 65 ground squirrels, submitted on June 24, all taken from a ranch at Keene, Kern County.

Under date of July 12

In 3 ground squirrels, submitted to the laboratory on June 28 and 30, and in a pool of 361 fleas from 27 ground squirrels, collected on June 28, from the same ranch, at Keene, Kern County.

PLAGUE INFECTION IN FLEAS IN NORTH DAKOTA

Under date of July 12, 1941, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported plague infection demonstrated in fleas collected on June 23, 1941, from ground squirrels (*C. richardsonii*) shot in an area located about 7 miles northeast of Crosby, Divide County, N. Dak., and about 6 miles south of the Saskatchewan-North Dakota boundary.[1]

This is the first recorded evidence of plague infection in North Dakota, and it is believed that the locality is the farthest east in which infection has been found in wild rodents or their ectoparasites in the United States.[2]

[1] See page 1520.

[2] In 1939 plague infection was found in a kangaroo rat in Dona Ana County, N. Mex. (See PUBLIC HEALTH REPORTS, March 19, 1939, p. 850.)

WEEKLY REPORTS FROM CITIES

City reports for week ended July 5, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	88	26	12	1,717	294	531	7	348	42	1,300	--------
Current week [1]	35	20	11	1,675	255	330	1	301	17	1,061	--------
Maine: Portland	0	------	0	0	2	0	0	0	0	3	19
New Hampshire:											
Concord	0	------	0	0	0	1	0	0	0	0	7
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	0	------	0	1	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	65	9	25	0	7	0	14	198
Fall River	2	------	0	1	1	3	0	1	0	0	22
Springfield	0	------	1	61	0	1	0	1	0	6	24
Worcester	0	------	0	4	1	1	0	2	0	1	40
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	0	8
Providence	0	------	0	1	1	0	0	2	0	18	42
Connecticut:											
Bridgeport	0	------	0	9	1	2	0	1	0	0	25
Hartford	0	------	0	2	0	1	0	3	0	1	43
New Haven	0	------	0	12	1	2	0	0	0	1	38
New York:											
Buffalo	0	------	0	33	8	4	0	5	0	6	118
New York	7	3	0	200	46	60	0	77	2	89	1,381
Rochester	0	------	0	37	2	2	0	0	0	4	68
Syracuse	0	------	0	11	5	2	0	0	0	21	58
New Jersey:											
Camden	0	------	0	4	1	2	0	1	0	2	22
Newark	0	------	0	23	3	6	0	4	0	21	68
Trenton	0	------	0	5	2	1	0	2	0	0	33
Pennsylvania:											
Philadelphia	0	------	0	32	14	31	0	19	1	44	437
Pittsburgh	2	------	0	109	9	0	0	9	0	40	159
Reading	0	------	0	4	1	0	0	1	0	2	21
Scranton	0	------	--------	34	-------	0	0	-------	0	0	--------
Ohio:											
Cincinnati	0	------	0	5	0	4	0	2	0	2	106
Cleveland	1	1	0	4	9	13	0	6	0	46	193
Columbus	0	------	0	16	2	3	0	1	0	28	73
Toledo	0	------	0	178	4	1	0	4	0	37	79
Indiana:											
Anderson	0	------	0	9	0	2	0	0	0	0	6
Fort Wayne	0	------	0	2	0	0	0	0	2	0	22
Indianapolis	0	------	0	30	3	2	0	4	0	2	89
Muncie	0	------	0	2	0	0	0	0	0	2	10
South Bend	0	------	0	2	0	0	0	0	0	0	12
Terre Haute	0	------	0	0	0	0	0	2	0	0	14
Illinois:											
Alton	0	------	0	0	1	0	0	0	0	0	13
Chicago	9	1	2	41	20	35	0	36	0	39	639
Elgin	1	------	0	2	0	0	0	1	0	2	13
Moline	0	------	0	0	0	0	0	0	0	0	12
Springfield	0	------	0	42	1	0	0	0	0	0	20
Michigan:											
Detroit	0	1	2	139	8	42	0	14	1	78	271
Flint	0	------	0	5	0	0	0	0	0	3	25
Grand Rapids	0	------	0	34	1	4	0	0	0	3	38
Wisconsin:											
Kenosha	0	------	0	3	0	0	0	0	0	0	7
Madison	0	------	0	1	0	6	0	0	0	0	15
Milwaukee	0	1	1	235	1	10	0	0	0	31	92
Racine	0	------	0	27	0	1	0	1	0	4	9
Superior	0	------	0	0	0	0	0	0	0	8	6

[1] Figures for Raleigh and Helena estimated; reports not received.

City reports for week ended July 5, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Minnesota:											
Duluth	0	------	0	0	1	1	0	0	0	18	12
Minneapolis	0	------	0	5	3	2	0	1	0	10	95
St. Paul	0	------	0	0	3	1	0	0	0	26	44
Iowa:											
Cedar Rapids	0	------	------	3	------	1	0	------	0	1	------
Davenport	0	------	------	1	------	1	0	------	0	0	------
Des Moines	0	------	------	2	------	2	0	------	0	4	25
Sioux City	0	------	------	0	------	0	0	------	0	8	------
Waterloo	0	------	------	11	------	0	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	15	5	3	0	1	0	8	87
St. Joseph	0	------	0	0	7	1	0	0	0	0	32
St. Louis	1	------	0	50	8	13	0	7	0	30	191
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	7	6
Grand Forks	0	------	------	1	------	0	0	------	0	0	------
Minot	0	------	------	4	------	0	0	------	0	0	8
South Dakota:											
Aberdeen	0	------	------	1	------	1	0	------	0	2	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	9
Nebraska:											
Lincoln	0	------	------	2	------	2	0	------	0	2	------
Omaha	0	------	0	5	1	0	0	0	0	0	41
Kansas:											
Lawrence	0	------	0	0	0	1	0	0	0	0	2
Topeka	0	------	0	1	2	0	0	1	0	42	23
Wichita	0	------	0	1	1	0	0	0	0	8	26
Delaware:											
Wilmington	0	------	0	0	2	2	0	1	0	1	29
Maryland:											
Baltimore	0	------	0	190	9	7	0	7	0	58	242
Cumberland	0	------	0	1	0	0	0	0	0	2	13
Frederick	0	------	0	0	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	1	------	0	60	6	3	0	13	0	9	177
Virginia:											
Lynchburg	0	------	0	18	0	0	0	2	0	4	16
Norfolk	0	------	0	3	2	0	0	1	0	0	29
Richmond	1	------	0	10	0	1	0	1	0	0	60
Roanoke	0	------	0	1	0	0	0	0	0	3	16
West Virginia:											
Charleston	0	------	0	0	2	0	0	0	0	0	31
Huntington	0	------	------	1	------	0	0	------	0	1	------
Wheeling	0	------	0	12	0	0	0	0	0	3	24
North Carolina:											
Gastonia	0	------	------	3	------	0	0	------	0	0	------
Raleigh	------	------	------	------	------	------	------	------	------	------	------
Wilmington	0	------	0	4	0	0	0	0	0	25	7
Winston-Salem	0	------	0	8	1	0	0	1	0	1	18
South Carolina:											
Charleston	0	2	0	0	0	0	0	3	0	0	14
Florence	0	------	0	0	1	0	0	0	0	3	7
Greenville	0	------	0	0	0	1	0	0	0	3	13
Georgia:											
Atlanta	1	------	0	1	2	1	0	3	1	0	62
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	0	------	0	3	0	1	0	0	0	1	28
Florida:											
Miami	0	------	0	5	1	0	0	2	0	2	19
St. Petersburg	0	------	0	4	1	0	0	1	0	0	21
Tampa	0	------	0	0	2	0	0	0	0	1	31
Kentucky:											
Ashland	0	------	0	5	0	0	0	2	1	0	11
Covington	0	------	0	0	1	1	0	0	0	0	17
Lexington	0	------	0	0	0	0	0	1	0	0	15
Louisville	0	------	0	22	2	17	0	4	0	4	56
Tennessee:											
Knoxville	0	------	0	10	1	0	0	1	0	0	38
Memphis	0	------	0	11	1	0	1	7	0	15	87
Nashville	0	------	1	2	3	0	0	0	0	5	49
Alabama:											
Birmingham	0	------	0	7	2	0	0	4	1	6	73
Mobile	0	------	0	0	2	0	0	0	0	0	20
Montgomery	0	------	------	0	------	0	0	------	0	0	------

City reports for week ended July 5, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0			1		0	0		1	0	
Little Rock	0		0	5	2	0	0	0	0	4	31
Louisiana:											
Lake Charles	0		0	0	0	0	0	0	0	0	2
New Orleans	0	1	2	0	4	0	0	8	2	11	146
Shreveport	1		0	0	4	0	0	4	0	0	43
Oklahoma:											
Oklahoma City	0	1	0	4	5	1	0	0	0	0	33
Tulsa	0		0	1	1	0	0	0	0	11	6
Texas:											
Dallas	1	1	1	7	2	0	0	4	0	3	65
Fort Worth	0		0	0	1	1	0	0	0	4	35
Galveston	0		0	0	0	1	0	8	1	2	17
Houston	0		0	0	4	1	0	3	1	0	72
San Antonio	0	1	1	1	3	1	0	4	0	1	65
Montana:											
Billings	0		0	0	0	0	0	0	0	0	6
Great Falls	0		0	1	2	0	0	0	1	1	9
Helena											
Missoula	0		0	0	0	0	0	0	0	0	6
Idaho:											
Boise	0		0	0	0	0	0	0	0	0	5
Colorado:											
Colorado Springs	0		0	0	0	1	0	1	0	5	12
Denver	2	5	0	25	1	2	0	4	0	60	71
Pueblo	0		0	2	1	0	0	0	0	2	6
New Mexico:											
Albuquerque	1		0	0	0	0	0	3	0	1	13
Arizona:											
Phoenix	0	11		2		0	0		1	7	
Utah:											
Salt Lake City	1		0	2	1	0	0	0	0	18	28
Washington:											
Seattle	2		0	0	5	3	0	4	0	25	113
Spokane	0		0	1	1	2	0	0	1	7	28
Tacoma	0		0	0	0	0	0	0	0	5	10
Oregon:											
Portland	0	1	0	3	0	4	0	2	0	1	53
Salem	0			0		0	0		0	0	
California:											
Los Angeles	0	1	0	14	5	10	0	8	0	48	278
Sacramento	2		0	1	0	4	0	1	3	19	28
San Francisco	1	2	0	3	4	3	0	4	0	43	163

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				South Carolina:			
Worcester	1	0	0	Charleston	1	0	0
New York:				Georgia:			
New York	3	0	1	Atlanta	0	0	9
Pennsylvania:				Florida:			
Pittsburgh	1	0	0	Miami	1	0	0
Illinois:				Kentucky:			
Chicago	1	0	0	Louisville	1	0	0
Minnesota:				Texas:			
St. Paul	0	0	5	Galveston	0	0	1
Maryland:				California:			
Baltimore	4	2	0	Los Angeles	0	1	1
Cumberland	1	0	0				
District of Columbia:							
Washington	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: Bridgeport, 1; New York, 3; Norfolk, 2. Deaths: New York, 1; Pittsburgh, 1; Topeka, 1.

Pellagra.—Cases: Atlanta, 1; Savannah, 4.

Typhus fever.—Cases: New York, 2; Savannah, 2; Miami, 1; Fort Worth, 1.

FOREIGN REPORTS

CUBA

Habana—Communicable diseases—4 weeks ended June 28, 1941.—During the 4 weeks ended June 28, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	9		Scarlet fever	3	
Malaria	1		Tuberculosis		2
Poliomyelitis	1		Typhoid fever	32	3

SWEDEN

Notifiable diseases—April 1941.—During the month of April 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	13	Poliomyelitis	7
Diphtheria	5	Scarlet fever	1,082
Dysentery	8	Syphilis	16
Epidemic encephalitis	2	Typhoid fever	33
Gonorrhea	770	Undulant fever	5
Paratyphoid fever	12		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January—April 1941	May 1941	June 1941—week ended—			
				7	14	21	28
ASIA							
China:							
Canton	C		131	41			
Hong Kong	C	634	148	30			
Macao	C		162	59	57	73	58
India:							
Calcutta	C	1,664					
Rangoon	C	32	10				
India (French)	C	15	6				
Japan: Taiwan	C	[1] 2					

[1] For February and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 1941—week ended—			
				7	14	21	28
AFRICA							
Belgian Congo	C	1					
British East Africa:							
Kenya	C	11	9				
Uganda	C	51	5				
Egypt: Port Said.[1]							
Madagascar	C	183	8	2			
Morocco	C	798	346	50	112	105	
Casablanca.[2]							
Tunisia: Tunis	C	2					
Union of South Africa	C	59					
ASIA							
China: Foochow	C		3				
Dutch East Indies:							
Java and Madura	C	287					
West Java	C	193					
India:							
Calcutta	C	3					
Rangoon	C	2	2				
Palestine: Haifa—Plague-infected rats			7				
Thailand: Lampang Province	C	1					
NORTH AMERICA							
Canada: Alberta—Plague-infected ground squirrel							1
SOUTH AMERICA							
Argentina: Cordoba Province	C	1					
Peru:							
Ancash Department	C	1					
Lambayeque Department	C	2					
Libertad Department	C	6					
Lima Department	C	6					
Moquegua Department	C		4				
Piura Department	C	2					
OCEANIA							
Hawaii Territory:[3] Plague-infected rats		11	24	3	3	3	
New Caledonia	C	9					

[1] During the week ended July 12, 1941, 8 cases of plague, including 2 suspected cases, with 4 deaths were reported in Port Said, Egypt.
[2] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco, where several deaths had occurred.
[3] During April and May, 4 lots of plague-infected fleas were reported in Hawaii Territory.

SMALLPOX

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 7	June 14	June 21	June 28
AFRICA							
Algeria	C	93	19				
Belgian Congo	C	48					
British East Africa	C	9	7				
Dahomey	C	367	85	2			
French Guinea	C	23	22				
Ivory Coast	C	30		2			
Morocco	C	31					
Nigeria	C	412	57				
Niger Territory	C	195	26	5	3		
Portuguese East Africa	C	9					
Rhodesia: Southern	C	86					
Senegal	C	43	9	1	3		
Sierra Leone	C	15					
Sudan (Anglo-Egyptian)	C	7					
Sudan (French)	C	19					
Union of South Africa	C	94					

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 1941—week ended— 7	14	21	28
ASIA							
Ceylon	C		32				
China	C	142	49	2	4	1	2
Chosen	C	464					
India	C	10,006					
India (French)	C	4	2				
India (Portuguese)	C	44					
Indochina (French)	C	505	197			[1] 64	
Iran	C	4					
Iraq	C	939					
Japan	C	109	15				
Straits Settlements	C	1					
Syria	C	1					
Thailand	C	103	115	2	4		
EUROPE							
France	C	1					
Portugal	C	20	3				
Spain	C	98	31				
NORTH AMERICA							
Canada	C	13	9				
Cuba	C	1					
Dominican Republic	C	2					
Guatemala	C	4	1				
Mexico	C	21					
SOUTH AMERICA							
Colombia	C	223	1			2	
Peru	C	249					
Uruguay	C	7					
Venezuela (alastrim)	C	79	8		3		

[1] For 3 weeks.

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 1941—week ended— 7	14	21	28
AFRICA							
Algeria	C	3,561	2,036		[1] 706		
British East Africa: Kenya	C	[3] 2					
Egypt	C	2,740	843				
Morocco	C	241	144	37	44	69	
Sierra Leone	C	5					
Tunisia	C	1,706	1,058				
Union of South Africa	C	115					
ASIA							
China	C	86	59	24			
Chosen	C	68					
Iran	C	70					
Iraq	C	20					
Japan	C	240	55				
Palestine	C	9	5				
Straits Settlements	C	2					
EUROPE							
Bulgaria	C	85	60	9			
Germany	C	554	270				
Gibraltar	C		2				
Greece	C	7					
Hungary	C	136	97	9	6	21	
Irish Free State	C	13	13				

See footnotes at end of table.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 1941—week ended— 7	14	21	28
EUROPE—continued							
Poland	C	145	97				
Rumania	C	486	76	8	8		
Spain	C	1,277	1,073	405			
Switzerland	C	2			1		
Turkey	C	[3] 175					
Yugoslavia	C	78					
NORTH AMERICA							
Guatemala	C	92	11				
Mexico	C	21	2	2			
Panama Canal Zone	C	3					
SOUTH AMERICA							
Chile	C	58	9				
Ecuador	C	50	15				
Peru	C	453					
Venezuela	C	26					
OCEANIA							
Australia	C	8					
Hawaii Territory	C	10	3		1	1	1

[1] For June 1-10, 1941.
[2] For the month of April 1941.
[3] For January and February 1

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January—April 1941	May 1941	June 1941—week ended— 7	14	21	28
AFRICA							
Belgian Congo:							
Kimvulu	C					1	
Libenge	C					1	
French Equatorial Africa	C	2					
Gold Coast	C	1					
Ivory Coast	C	[1] 3					
Spanish Guinea	D		4				
SOUTH AMERICA [2]							
Colombia:							
Antioquia Department	D	2					
Boyaca Department	D	5	1		1		
Intendencia of Meta	D	1	1				1
Santander Department	D	2	1				
Tolima Department	D	1					
Peru: Junin Department	C	5					

[1] Includes 2 suspected cases.
[2] All yellow fever reported in South America is of the jungle type unless otherwise specified.

X

Public Health Reports

VOLUME 56 AUGUST 1, 1941 NUMBER 31

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • AUGUST 1, 1941 • *No. 31*

PERTUSSIS PROPHYLAXIS WITH TWO DOSES OF ALUM-PRECIPITATED VACCINE [1]

By JOSEPH A. BELL, *Passed Assistant Surgeon, United States Public Health Service*

A single dose of an alum-precipitated pertussis vaccine was given preliminary clinical trial in 1936–37 in Cumberland, Md. (*1*). This small trial indicated that the vaccine produced no undue immediate reactions but suggested that even though some protection appeared to follow its use, the protection might not be sufficient to justify its public health use. The results were considered promising enough to warrant further investigation. Accordingly, in April 1938, the United States Public Health Service, in cooperation with the Norfolk City Union of King's Daughters Visiting Nurse Association in Norfolk, Va., began epidemiological studies on the public health aspects of the prophylactic use of two doses of alum-precipitated pertussis vaccine. It was considered that if two doses of the vaccine, given with a 4-week interval between doses, caused no undue immediate reactions and produced sufficient protective immunization, the two doses might be combined with alum-precipitated diphtheria toxoid and be generally acceptable for public health use.

This report on these studies is concerned exclusively with the single question as to whether the vaccine confers any real protection against pertussis. Other questions as to the amount, nature, promptness, and duration of such protection, and the suitability of the vaccine for general or special use, are important but subsidiary. They are to be treated in future reports and are omitted from this report.

The vaccine used in the present studies is identical with that used in the first study; it was originated at the National Institute of Health by Senior Surgeon Walter T. Harrison and, in brief, was prepared as follows: Each cubic centimeter represented a saline suspension of 10 billion unwashed pertussis bacilli and their products, killed with 0.5 percent phenol [2] and precipitated by the addition of 0.027 cc. of

[1] From the Division of Infectious Diseases and the Office of Cooperative Studies, National Institute of Health.

[2] This original bacterial suspension in 0.6 percent saline was Parke Davis pertussis vaccine, prepared according to the method of Dr. L. W. Sauer from strains of *Hemophilus pertussis* recently isolated from typical cases of pertussis and agglutinating to high titer in antiserum produced with other recently isolated smooth (phase I) strains. The cultures were grown on human blood potato agar for 48 hours at 37° C.

10 percent sodium bicarbonate solution and 0.25 cc. of 4 percent potassium alum solution; after washing the precipitate once in 0.85 percent saline, it was suspended in 1 cc. of 0.85 percent sodium chloride solution containing 1:7,500 merthiolate.

The method of administration was similar to that commonly used for two-dose alum-precipitated diphtheria toxoid. One cubic centimeter was injected subcutaneously into the deltoid region of one arm of very young children and after a 4-week interval a similar dose was injected into the other arm.[3] Vials were thoroughly shaken to secure an even suspension just before each injection. It is noteworthy that the total amount of vaccine here injected represented only 20 billion organisms, whereas 80 to 120 billion organisms have been commonly recommended for prophylactic pertussis immunizations.

The single question to be answered by this report is whether the vaccine confers any real protection against the disease. Since the public health aspect of the disease is of chief concern, it was necessary that the observed children be representative of the general population. To answer the question it was necessary to have a clinical-epidemiological arrangement whereby a large group of children injected with the vaccine could be uniformly observed together with a group of children not injected with the vaccine but otherwise identical in all attributes which might influence the results. Three major problems were immediately evident: (1) The obtaining of an injected group identical in such attributes with a noninjected group; (2) the uniform observation of injected and noninjected groups over a period of time long enough to give an adequate experience of pertussis; and (3) the definition of pertussis as a clinical entity which, within the limits of observation available, could be uniformly and readily recognized in the injected and noninjected groups.

The first problem was that of locating for observation a group of children to be vaccinated, identical, in all attributes which might influence the occurrence and recognition of pertussis, with another

[3] The local and general reactions to injection of the vaccine appeared to be similar to those usually encountered in the immunization of children with alum-precipitated diphtheria toxoid. Comparatively few children had any noticeable reaction whatsoever. Some children were fretful and had a slight rise in body temperature during the first 24-48 hours following injection. The firm nodule developing after the injection of the precipitate was seldom noticed by the parents. When the vaccine was injected into the deltoid muscle, some pain was manifest on arm movement during the first 1-4 days. On the other hand, when the vaccine was injected too superficially there seemed to be a tendency for the nodule to remain soft and in a very few instances to rupture through the skin. In such cases the contents discharged were sterile, no infection occurred, and the condition was accompanied by no appreciable pain or tenderness, and by no enlargement of the lymph glands, or fever. This superficial injection of the vaccine was observed almost exclusively in the first group of children injected by two physicians whose early technique for injection consisted of inserting the needle almost parallel to the arm into a loose fold of skin picked up by the fingers of the left hand. It seems that the better technique is to grasp the arm from below with the left hand, draw the tissues tense over the deltoid muscle and insert the needle at an angle of about 15°, so that the vaccine will be deposited in the loose subcutaneous tissue.

group to receive no vaccine. It is impossible to select such identical groups because many of the attributes involved are not known, and many of those that are known cannot be quantitatively assessed; and, furthermore, even if such attributes could be made identical in the two groups at any one moment, they would not remain identical throughout the time necessary for adequate observation. Some attributes without apparent influence on the results may under certain circumstances be of real importance.

The only practical approach appeared to rest in the selection of two groups, each of which is a random sample of the combined groups in the exact sense of the term. Thus only can the prediction be made that should the vaccine have no real influence on the occurrence of pertussis, the occurrence in each group will approximate that of the combined group, deviating therefrom strictly within the range of chance sampling variation. On the other hand, if the vaccine confers real protection against the disease, or otherwise really influences its occurrence, the occurrence in each group will differ from that of the combined group outside the range of chance sampling variation. Obviously it is not practically possible to preselect two large strictly random groups of children who are representative of the general population and to insure that every child in one group receives the vaccine while every child in the other group receives no vaccine during the observation period. Children in the general population have the prerogative to refuse vaccine offered and the liberty to obtain other vaccine when desired. In these premises there is no known way of changing the two groups so that one would include only children actually vaccinated, and the other include only children not vaccinated, without destroying the randomness of the selection and to that extent possibly invalidating the answer to the question asked. After it has been established that the vaccine confers protection, then questions concerning the amount and duration of such protection might in part demand direct comparison of the experience of the children actually vaccinated with those not vaccinated, providing adequate data are at hand to equalize the two groups with respect to attributes which apparently influence the occurrence of the disease.

For this report, the approach to the primary problem involved the preselection of two large strictly random groups of children and the subsequent injection of a large proportion of only one group with the vaccine. All analyses herein presented are a comparison of the experience of such preselected groups regardless of their actual status with respect to receiving the vaccine. The difficulties encountered in this approach are chronologically described in detail so that the reader may evaluate any possible errors involved.

During March, April, and May, 1938, a public health nurse transcribed the names of children born between May 1, 1935, and March

31, 1938, who were on the various rolls of the King's Daughters Visiting Nurse Association. All of the names were not transcribed. Children whose records indicated that they had had prior whooping cough, children who were known to have left the city permanently, and a few of the children of well-to-do parents who, the nurse thought, were subject to pertussis vaccination apart from that given in the course of this study, were not transcribed.

The city of Norfolk, adjacent suburbs, and South Norfolk were divided into 14 geographic sections. The definition of boundaries of each section was the result of an endeavor to group people somewhat according to their usual association in schools, churches, theaters, and shopping districts. The children in each section are either white or colored, no one section having both.

A total of 1,954 names was transcribed, together with information as to sex, birth date, and address of residence, as recorded on the rolls from which they were copied. The names were transcribed in 14 groups according to geographic section of residence. In each group the names were listed in alphabetical order for each year of birth and the years of birth were ordered chronologically. A numbering machine was used to stamp a serial number after each name in the above order. Using the "Random Sampling Numbers" as assembled and published by L. H. C. Tippett (*2*), the allotted numbers in each section were divided at random into two equal groups hereinafter designated as the "V" and "N" groups.

Since there was an epidemic of pertussis in Norfolk during the spring and early summer of 1938, an effort was made to have the children selected in the "V" group injected with vaccine at an early date. Hence a search to locate the children selected in the "V" group and get consent for their injection with pertussis vaccine was made in April and May 1938, whereas no search for the "N" group was made until July. The vaccine was offered only to the "V" group and not to the "N" group or to other children. There were very few refusals even though no promises were made as to the effectiveness of the vaccine. Parents giving consent for vaccination were mailed an appointment card to bring the "V" child to a health station for his first dose of vaccine on May 23–25, 1938. The second dose was given 4 weeks later, in a similar manner. Certain "V" children who did not keep their appointments, and others who were ill, or who were temporarily out of the city, or who were not located as of those dates, were offered vaccine at later dates. Eighty-eight percent of the "V" children who received vaccine had their first dose prior to July 3, and practically all the vaccinations accomplished were completed before the end of September 1938.

During the early period of observation when visiting records of all children located were being checked, 129 selected children were found

whose names had been transcribed from several rolls and hence each had been assigned two or more numbers, often being selected in both the "V" and "N" groups. Thus a supplementary sampling process was necessary to allocate these children into either the "V" or "N" group in a strictly random manner. To this end the lowest of the numbers assigned to any child became his final number and designated his selected status in either the "V" or the "N" group. Of the 129 children, all numbers of 61 were either in the "V" or in the "N" group and hence their selected status remained unchanged. Of the remainder, 38 were assigned to the "N" group, including 21 who previously received vaccine, and 30 were assigned to the "V" group, of whom 21 subsequently received vaccine.

The above description of the first problem sets forth the practical difficulties encountered in this effort to preselect the names of a large number of children in two strictly random groups, locate the children represented by those names, eliminate the duplicates, secure two groups suitable for adequate observation, and insure that a large proportion of one group receive alum-precipitated pertussis vaccine prophylactically, while a large proportion of the other group receive no vaccine. Table 1 reveals the result of this effort. It is noted that the two groups completely observed are not equal in number, even though they were originally so selected. The search for the children in each group was pursued with equal diligence and all available evidence is consistent with the belief that the smaller size of the "N" group of children observed does not disturb the randomness of either

TABLE 1.—*Derivation of 2 random groups of children available for complete observation, and number in each group receiving prophylactic[1] pertussis vaccine before end of observation period*

	"V" group	"N" group	"V"+"N" group
(a) Original names transcribed from health station and clinic rolls	976	978	1,954
(b) Children located for observation as of June 1, 1938, after allocation of duplicates in (a)	641	571	1,212
(c) Children located (b) with history of definite pertussis prior to June 1, 1938	69	68	137
(d) Children lost from observation during interval June 1, 1938–March 30, 1941 (exclusive of c)	79	71	150
(e) Children completely observed throughout interval June 1, 1938–March 30, 1941 (b minus c minus d)	493	432	925
(f) Observed children (e) receiving alum-precipitated pertussis vaccine prophylactically[2]	454	24	478
(g) Observed children (e) receiving other pertussis vaccine prophylactically	14	20	34

[1] A vaccine was considered to have been given prophylactically if given to a child who did not have a definite case of pertussis with cough beginning within 3 weeks following the first injection of vaccine.
[2] Of the 478 receiving alum precipitated vaccine, all received two doses except 11 in the "V" group and 2 in the "N" group, who received only one dose.

group and was due to the later date of search for this group, after school was dismissed and summer vacation in progress.

The second problem, that of obtaining adequate uniform observation of the injected and noninjected children, was handled by the full-time employment of only two highly capable, sympathetic, and interested public health nurses experienced in communicable disease work in this city. Together they received special training to perfect their uniform approach to the families of the selected children, their uniform use of nonleading questions, their uniform vocabulary for eliciting information desired, and their uniform accuracy in obtaining, evaluating, and recording such information. The nurses expended no little effort in gaining the confidence of the families under their surveillance so as to enhance the amount and trustworthiness of the information elicited. To aid cooperation, the nurses contributed their experienced health teaching service and offered free clinic and hospitalization service for illnesses in children of families unable to afford medical service. They were not officially concerned with the quarantine of communicable disease; however, they endeavored to persuade voluntary isolation of cases during the communicable period.

A visiting record was prepared for each household in which a selected child resided. The nurses divided the records about equally, primarily on the basis of routes convenient for a routine visit once each month to each child, but during the earlier months of observation, time did not permit revisiting within the month children found not at home at the time of the routine monthly visit. It is of interest to note that division of the work on this basis resulted in each nurse having a nearly equal proportion of children in the "V" and "N" groups and a nearly equal proportion of older and younger children, and also, as would be expected, a disproportionate number of white and colored children.

Soon after the start of monthly surveillance it became evident that adequate observation required that the nurses make repeated weekly and more frequent visits during the course of pertussis infection. To accomplish this the families were requested to call the nurse for other than routine visits whenever anyone living in the household with the selected child was exposed to or had suspicious symptoms of common communicable disease. Other public health nurses in the city cooperated by the daily reporting of all cases of communicable disease coming to their attention. This special effort to effect early visiting of cases was not instituted until after the 1938 pertussis epidemic. Partly as the result of this, 20 percent of the cases of pertussis occurring in the "V" group of children under observation throughout the interval from June 1, 1938, to March 30, 1941, did not receive weekly visits before the end of the fourth week following onset of cough, and 17 percent of cases in the "N" group did not receive such early weekly visits. Of the remaining cases, 73 percent occurring in the "V" and 76 percent occurring in the "N" group of children were under weekly

or more frequent observation before the end of the second week of cough. This indicates the uniformity with which the "V" and "N" groups were observed and suggests the adequacy of observation. The nurses did not know which of the children were in the "V" or "N" group and made every reasonable effort to avoid knowing which of the children had received pertussis vaccine. Of course, informants not infrequently would invite the nurses' attention to children supposed to have received the vaccine, but little credence was given to such information because some parents were obviously confused between pertussis and diphtheria injections.

A consulting pediatrician was employed to examine many of the cases and suspected cases of pertussis and to make a written report especially noting other diseases which might influence severity or obscure diagnosis. He did not know what criteria the author used for the diagnosis of clinical pertussis, and his report was not submitted until the end of the observation period here reviewed; he did not have access to the nurses' records and his opinions were not made known to them during the course of the study.[4] The author also made at least one visit with the nurse to every case of suspected pertussis, evaluated symptoms elicited, and arrived at a conclusion with respect to diagnosis. This was done entirely independently of the consulting pediatrician, and, like him, without knowledge of whether the child had had pertussis vaccine or had been selected in the "V" or "N" group.

The third problem was to define pertussis as a clinical entity which, within the limits of observation available, could be uniformly and readily recognized in the "V" and "N" groups. To this end the following minimal criteria were adopted for the author's diagnosis of a definite case of clinical pertussis.

(*a*) The child must have a cough lasting longer than 18 days, and for at least 8 days of this time the cough must be unremittently paroxysmal in type and recur at least three times each calendar day of the 8. The paroxysm is defined as a spell, spasm, or fit of coughing with a sudden onset at a not definitely predictable time. The child must be practically, if not absolutely, free from cough during the period between paroxysms; due allowance in judgment, however, was permitted for children having coughs due to other causes upon which pertussis infection may be superimposed.

(*b*) The paroxysm must consist of a rapidly repeated series of coughs, most of which result in almost complete exhalation of supplemental air as evidenced by history or observation of suffusion of the face and watering of the eyes, and either whooping following most of the series of coughs or the repeated occurrence of four or more successive coughs without intervening inhalation. The intensity of the

---

[4] Although the pediatrician was at a disadvantage in that he was seldom acquainted with the family visited, and usually made only one visit, and often that visit was not at the optimum time for obtaining the best history upon which to base his opinion as to diagnosis, there was remarkable uniformity between his diagnoses and those independently made by the author, after more detailed and complete information was available. The consultant considered at the time of his visit that 2 "V" and 1 "N" children had pertussis, whereas the author finally classified these children as doubtful cases, that is, not definite clinical pertussis. On the other hand, the consultant considered another "V" child to have a doubtful case, whereas the author finally classified the case as definite.

paroxysm must be sufficient to arouse the child from a deep sleep on many occasions and to cause him, if physically able, to sit up in bed, or at least to get up on his knees, to cough and get his breath.

(*c*) Clinical pertussis must be the most likely clinical diagnosis in the judgment of the examining physician, regardless of history of prior attack of pertussis, recent exposure to the disease, or information, which occasionally might be disclosed, concerning vaccination against the disease.

(*d*) The information concerning the clinical syndrome must be sufficiently reliable and complete to establish beyond reasonable question the true existence of the above minimal criteria.

It was recognized that the above more or less arbitrary definition might not suffice. Accordingly, detailed clinical records were kept for each child, recording the occurrence, duration, nature, frequency, and intensity of cough, paroxysmal cough, whooping, vomiting, and other symptoms and signs of clinical pertussis. One of the purposes for collection of this mass of data was to permit eventually an objective decision as to the definition of a case of pertussis, subject to modification as data accumulated. For this report the above definition was adhered to, and it is intended to include only frank cases of pertussis and to exclude possible subclinical and borderline cases.

The above discussion of the three major problems involved in this effort to determine whether or not the vaccine confers any real protection against pertussis describes the clinical-epidemiological arrangement whereby certain specific information was accumulated. A history of the past and current experiences of each child with measles, chickenpox, mumps, and pertussis was meticulously sought. It was recorded together with the date of such experience as accurately as this could be reasonably approximated. These data were checked and rechecked during the period of observation, particularly at times when the disease occurred in the neighborhood and the informant's memory was stimulated thereby. Whenever a history of experience with communicable disease was obtained, every reasonable effort was made to confirm it. This history, in practically every instance, consisted of a detailed description of the disease experience and was further confirmed by consultation with the private or clinic physician whenever one had been in attendance. On each monthly visit to the household the nurse made specific inquiry and record concerning each child with respect to all illnesses, particularly coughs and coryzas, and exposures to communicable disease that occurred during the month since last visit.

The period of observation covered by this report began June 1, 1938, and ended March 30, 1941, and was approximately the 34 months following the injection of the first dose of vaccine in the "V" group. Table 1 shows that 137 located children had had pertussis prior to this period. These 137 children were dropped from further observation prior to June 1, 1938. No child was dropped on account

of an attack of pertussis or any other disease subsequent to June 1, 1938. All other selected children have been kept under continuous monthly observation since, unless they became lost on account of moving away from the city or dying. As indicated in table 1, 79 of the "V" and 71 of the "N" group were thus lost during the observation period; of these, 1 of the "V" and 7 of the "N" group had an attack of pertussis during the observation period prior to being lost. The experience of these 150 lost children and of the 137 with a previous history of pertussis is included in the first part of table 2 but not included in the other tables, 3 and 4, of this report.

RESULTS

Table 2 records the experience of the "V" and "N" groups of children with measles, chickenpox, mumps, and pertussis, both prior to and during the observation period. Since age is important, but constantly changing, the experience for each disease has been divided according to whether the children were born (A) prior or (B) subsequent to July 1, 1937. Thus the children of the "B" subdivision were less than 11 months of age on June 1, 1938, the start of the observation period. Table 2 shows that the proportionate number of cases of measles, chickenpox, and mumps that occurred in the "V" and "N" groups of children (subdivided by age) prior to June 1938, and also from June 1938 to March 1941, were as nearly equal as might be expected by chance sampling variation. Likewise the proportionate number of cases of pertussis occurring in the "V" and "N" groups prior to June 1938 were approximately equal. In striking contrast, the proportionate number of cases of pertussis occurring in children during the 34-month observation period was much lower in the "V" than in the "N" group, in both the younger and older subdivisions.

Table 2 divides the children into subdivisions, A and B, according to birth date. Three other tabulations were prepared under exactly the same captions as table 2, with the exception that instead of dividing the "V" and "N" groups of children according to birth date, one tabulation divided the groups according to sex, another according to color, and the third according to geographic section of residence.[5] Each of these tabulations showed the same similarities and difference as those mentioned above for table 2. The proportionate number of cases of measles, chickenpox, and mumps in the past and in the observed experience of the "V" and "N" groups so subdivided by sex, color, and section of residence, were as nearly equal as might be expected by chance sampling variation in random groups. Likewise

[5] In the subdivision of the "V" and "N" groups by geographic section, all children were assigned to the section in which they resided as of June 1, 1938, and several of the smaller and outlying sections were combined so as to give 6 larger sections, 3 colored and 3 white. This subdivision resulted in some instances in an extremely small experience, but, in spite of this, the distribution of cases was remarkably consistent with the conclusions.

TABLE 2.—*Measles, chickenpox, mumps, and pertussis in "V" and "N" groups of children born (A) prior and (B) subsequent to July 1, 1937*

Disease	Birth date	Selection	Part 1: Experience prior to June 1, 1938, of children located as of that date having known history with respect to specified disease — Number of children	Part 1 — Number of cases	Part 1 — Percent attacked	Part 2: Observed experience of children having no attack of specified disease prior to June 1, 1938, and observed throughout the subsequent 34 months — Number of children	Part 2 — Number of cases	Part 2 — Percent attacked
Measles	A	V	323	69	21.36	204	35	17.16
		N	271	61	22.51	184	30	16.30
		Total	594	130	21.89	388	65	16.75
	B	V	277	13	4.69	224	26	11.61
		N	242	12	4.96	196	21	10.71
		Total	519	25	4.82	420	47	11.19
Chickenpox	A	V	283	28	9.89	234	45	19.23
		N	245	29	11.84	203	44	21.67
		Total	528	57	10.80	437	89	20.37
	B	V	252	9	3.57	226	54	23.89
		N	227	5	2.20	197	32	16.24
		Total	479	14	2.92	423	86	20.33
Mumps	A	V	281	5	1.76	254	36	14.17
		N	244	1	0.41	230	33	14.35
		Total	528	6	1.14	484	69	14.26
	B	V	252	2	0.79	232	13	5.60
		N	227	0	----------	202	16	7.92
		Total	479	2	0.42	434	29	6.68
Pertussis	A	V	344	52	15.12	259	29	11.20
		N	304	45	14.80	230	90	39.13
		Total	648	97	14.97	489	119	24.34
	B	V	297	17	5.72	234	22	9.40
		N	267	23	8.61	202	60	29.70
		Total	564	40	7.09	436	82	18.81

the past experience of pertussis was nearly equal in the "V" and "N" groups, but again, in each subdivision of each of the three tabulations, the occurrence of pertussis during the observed, postvaccinal period was much lower in the "V" than in the "N" group.

Another tabulation covering the observation period was prepared showing the number of cases of pertussis occurring under the observation of each nurse making the monthly visits. For each of the two nurses the low incidence of cases in the "V" group was consistent, being 11 and 10 cases per hundred children as compared with 32 and 38 in the "N" group, for the two nurses, respectively.

Table 3 arranges the 201 cases of pertussis that occurred in the "V" and "N" groups according to an arbitrary grouping by the number of days' duration of paroxysmal coughing and whooping. It shows that if more conservative criteria with respect to duration of paroxysmal cough had been adopted for the definition of a case of

TABLE 3.—*Distribution of definite cases of pertussis occurring during 34-month interval, June 1938–March 1941, in the "V" and "N" groups of children under observation throughout that interval, according to duration of paroxysmal coughing and whooping*

Days duration		"V" group (493 children observed)		"N" group (432 children observed)		"V"+"N" groups	Ratio "N" percent/"V" percent
Paroxysmal coughing	Whooping [1]	Number of cases	Percent of children observed	Number of cases	Percent of children observed	Number of cases	
9-27	0-27	27	5.48	27	6.25	54	1.14
More than 27	0-27	11	2.23	54	12.50	65	5.61
More than 27	More than 27	13	2.64	69	15.97	82	6.05
All cases		51	10.34	150	34.72	201	3.36

[1] 2 cases in the "V" and 11 in the "N" group had no whooping.

pertussis, the difference between the "V" and "N" groups in the observed experience with pertussis would have been even more striking than with the criteria used.

Table 4 presents the total white and colored experience with pertussis during the 34-month observation period. In connection with this table it may be stated that the colored "V" group was more completely vaccinated than the white "V" group, and the colored "N" group was more completely not vaccinated than the white "N" group. Ninety-eight percent of the children in the colored "V" group received one or more injections of pertussis vaccine prophylactically as against 91 percent in the white "V" group, and 91 percent in the colored "N" group were entirely without prophylactic vaccine as against 88 percent in the white "N" group.

It is believed that the observed incidence of pertussis in the "N" group is a normal incidence of pertussis because nothing was done to this group which would be expected to influence appreciably the incidence and because the estimated average annual attack rate (110

TABLE 4.—*Distribution of definite cases of pertussis occurring during 34-month interval, June 1938–March 1941, in white and colored children under observation throughout that interval according to selection in the "V" or "N" group*

Color	Selection	Number of children	Number of cases	Percent attacked	Ratio "N" percent/"V" percent
White	V	220	26	11.82	
	N	199	62	31.16	
	Total	419	88	21.00	2.64
Colored	V	273	25	9.16	
	N	233	88	37.77	
	Total	506	113	22.33	4.12
White and colored	V	493	51	10.34	
	N	432	150	34.72	
	Total	925	201	21.73	3.36

per 1,000) for the white children observed approximates that commonly reported for white children in this age group and environment, even though the observed experience covers one and one-half epidemic periods and only one inter-epidemic period. Since the "V" and "N" groups of children in this study were strict random samples of the combined groups, since the observation of each group was pursued with equal diligence and uniform criteria were used to enumerate cases, and since the only known difference between the groups was the injection of alum-precipitated pertussis vaccine into a large proportion of the "V" group of children, whereas only a small proportion of the "N" group of children were so injected, it is believed that the vaccine used was responsible for the disproportionately smaller number of cases of pertussis observed in the "V" as compared with the "N" group or with the combined groups. No other conceivable influence could be consistent with these results, operating in each geographic section of the city, in the white as well as in the colored race, in males as well as in females, and in the younger as well as in the older children.

CONCLUSION

The two 1-cc. doses of alum-precipitated pertussis vaccine injected, with a 4-week interval between doses, into a large proportion of a group of children in Norfolk, Va., conferred real protection against clinical attacks of the disease.

REFERENCES

(*1*) Harrison, W. T., Franklin, Jos. P., and Bell, Jos. A.: Prophylactic value of a single dose of precipitated pertussis vaccine. Pub. Health Rep., **53**: 793 (May 20, 1938).

(*2*) Tippett, L. H. C.: Random Sampling Numbers. Tracts for Computers, No. 15, edited by Karl Pearson. Cambridge University Press, London, 1927.

SUSCEPTIBILITY OF YOUNG MICE (*MUS MUSCULUS*) TO *LEPTOSPIRA ICTEROHAEMORRHAGIAE* [1]

By Carl L. Larson, *Assistant Surgeon, United States Public Health Service*

The guinea pig is generally accepted as the most suitable animal for use in experimental studies of Weil's disease for it develops a very characteristic disease following inoculation with material containing *Leptospira icterohaemorrhagiae*. Although mice (*Mus musculus*) have been found to be carriers of leptospirae in nature, they have not been widely used in the laboratory as they have been considered to be relatively resistant to infection. The purpose of this paper is to report the uniform susceptibility of young white mice (*Mus musculus*) to frank infection with *L. icterohaemorrhagiae.*

[1] From the Division of Infectious Diseases, National Institute of Health.

Inada et al. (*1*) found rabbits to be extremely resistant to *L. icterohaemorrhagiae* and white mice and rats only slightly less so. In regard to white mice, they write: "Fourteen were inoculated with the liver emulsion or blood of the infected guinea pig, of which four showed jaundice and slight hemorrhage and succumbed." Wirth (*2*), Noguchi (*3*), and Packchanian (*4*) have all noted that mice (*Mus musculus*) may be carriers of *L. icterohaemorrhagiae* under natural conditions and have isolated leptospirae from them. According to Hiroki (*5*), mice are less susceptible to leptospiral infections than are rats or guinea pigs. According to Langworthy and Moore (*6*), white mice become carriers of these organisms, and Uhlenhuth (*7*) found house mice to be free of infection in nature. In an excellent review Walch-Sorgdrager (*8*) has adequately summed up the experimental work dealing with the relation of mice and leptospirae and concludes that, while mice can be infected experimentally, they usually develop a mild type of disease resulting in the establishment of a carrier state.

Meyer et al. (*9*) failed to infect deer mice (*Peromyscus sp.*) with *L. icterohaemorrhagiae;* Packchanian (*10*), however, presented abundant evidence of the extreme susceptibility of deer mice to this organism, but believed white mice to be highly resistant. Twenty-eight white mice were inoculated with doses of leptospirae which were fatal to deer mice and guinea pigs, but none of the white mice succumbed. Packchanian states: "The mice (*Mus musculus*), which were also inoculated as controls, survived." Syverton, Stiles, and Berry (*11*) found gophers (*Citellus richardsoni*) to be subject to experimental leptospirosis. At present, the most valuable animals at hand for use in studies of Weil's disease appear to be guinea pigs and deer mice, but, for reasons of expense, availability, and interpretation of experimental results, it would be desirable to discover another animal combining the features of cheapness, adequate supply, and extreme susceptibility with that of being a natural host.

In view of the fact that white mice fulfill these requirements and since a few workers have succeeded in inducing clinical leptospirosis in a small proportion of white mice inoculated, it was deemed worth while to investigate further the susceptibility of these animals to experimental infection.

MATERIALS AND METHODS

The major portion of the work to be reported has been done with three strains of *Leptospira icterohaemorrhagiae*. All were isolated from wild rats (*Rattus norvegicus*). Strain 1653 was obtained from Dr. A. Packchanian, who recovered it from a wild rat trapped in Washington, D. C. It had been grown on Verwoort's medium by the author from April 4, 1940, to June 20, 1940, when mouse passage was begun.

During the above interval, it was tested for pathogenicity in guinea pigs and was found to be highly virulent.

L. icterohaemorrhagiae strain 11 was directly isolated in white mice by inoculation with a suspension of kidney taken from a wild rat trapped on a dump in Arlington County, Virginia, on July 12, 1940. This strain also is pathogenic for guinea pigs.

Dr. G. Denison kindly supplied us with strain 18, which was recovered in guinea pigs from a wild rat caught in Jefferson County, Alabama, in 1940.

The white mice used throughout the work were *Mus musculus* kept at the animal breeding quarters of the National Institute of Health at Bethesda, Md. Young animals, between 3 and 7 weeks old, were employed. It is important that young animals be chosen for studies of leptospirosis. They tolerate at least 0.6 cc. of suspension administered intraperitoneally.

No special techniques are required to establish leptospirosis icterohaemorrhagica in mice. Infective material is obtained from mice which are *in extremis* or which have but recently died. The liver and kidneys, or other selected organs, are removed under sterile precautions and ground in a mortar with sufficient salt solution to make a 10 percent emulsion. The suspension is allowed to settle for a short time in a conical container before inoculation in order that the gross particles of tissue may settle out. As occasion demands, further serial dilutions may be made in salt solution. This suspension is then inoculated intraperitoneally into the young mice in doses of 0.1 to 0.5 cc. Oral, subcutaneous, or intracerebral routes of injection may also be employed. Following administration of infective material the animals are observed for development of typical signs of the disease.

EXPERIMENTAL

Passage of leptospirae in mice.—In consideration of the fact that white mice (*Mus musculus*) were considered to be refractory to infection with *L. icterohaemorrhagiae,* strain 1653 was first passed through a known susceptible host before the initial attempt to establish it in mice, for it had been grown on artificial culture media for some time before inception of the experiment.

A deer mouse (*Peromyscus sp.*) was inoculated intraperitoneally with 0.2 cc. of a culture of strain 1653 on June 20, 1940. It died in 5 days with lesions characteristic of Weil's disease. The liver of this animal was removed and ground in saline with sand to make a 10 percent suspension. After settling, the supernatant fluid was injected into the peritoneal cavity of four white mice, all of which died within 8 days with generalized jaundice and hemorrhages in the lungs. *L. icterohaemorrhagiae* was isolated on Verwoort's medium

from three of the four mice. Continuous passage has been maintained in mice through 27 generations over a period of 183 days (table 1). During these passages only 3-week-old mice were used to perpetuate the strain. Inoculations were made intraperitoneally, using 0.2 to 0.5 cc. of a 10 percent liver and kidney suspension in salt solution. During the first 10 generations in mice the length of time elapsing between injection and death varied from 5 to 15 days, and during the next 10 passages from 4 to 9 days. No survivors were encountered in this series of mice and all animals presented jaundice prior to death.

TABLE 1.—*Serial passage of L. icterohaemorrhagiae (strain 1653) in white mice*

Passage No.	Date of inoculation (1940)	Number and species of mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organisms isolated	Guinea pigs inoculated and Weil's disease produced
	June 20	1 Peromyscus sp	1	June 25	5		
1	June 25	4 Mus musculus	4	July 1; July 3	6-8	3 of 4	
2	July 1	do	4	July 10; July 12	9-11	+	
3	July 10	do	4	July 19; July 21	9-11	+	
4	July 19	do	4	July 28; July 29	9-10		
5	July 28	do	4	Aug. 5	8		
6	Aug. 5	do	4	Aug. 12	7	--------	1—typical.
7	Aug. 12	do	4	Aug. 17; Aug. 22	5-10	--------	Do.
8	Aug. 17	do	4	Aug. 22; Aug. 24	5-7		
9	Aug. 24	6 Mus musculus	6	Aug. 30; Sept. 4	6-11	+	1—typical.
10	Aug. 31	do	6	Sept. 10; Sept. 15	10-15	+	Do.
11	Sept. 10	4 Mus musculus	4	Sept. 17	7	+	
12	Sept. 17	5 Mus musculus	5	Sept. 24; Sept. 26	7-9		
13	Sept. 24	do	5	Sept. 30; Oct. 2	6-8		
14	Sept. 30	do	5	Oct. 7	7	+	
15	Oct. 7	do	5	Oct. 12; Oct. 15	5-8	+	
16	Oct. 12	7 Mus musculus	7	Oct. 17; Oct. 18	5-6		
17	Oct. 17	5 Mus musculus	5	Oct. 23	6	+	
18	Oct. 23	7 Mus musculus	7	Oct. 28; Oct. 30	5-8		
19	Oct. 28	10 Mus musculus	10	Oct. 31; Nov. 4	4-7		
20	Nov. 4	do	10	Nov. 12; Nov. 14	8-10		
21	Nov. 12	5 Mus musculus	5	Nov. 18	6		
22	Nov. 18	do	5	Nov. 24; Nov. 25	6-7		
23	Nov. 25	do	[1] 4	Dec. 2	7	+	
24	Nov. 27	6 Mus musculus	6	Dec. 3; Dec. 4	6-7		
25	Dec. 3	5 Mus musculus	5	Dec. 7; Dec. 9	4-6		
26	Dec. 9	8 Mus musculus	8	Dec. 14; Dec. 17	5-8	--------	9—typical; 1—jaundiced but recovered.
27	Dec. 14	10 Mus musculus	10	Dec. 23; Dec. 25	6-8		

[1] 1 killed Nov. 27, 1940, for passage.

Strain 11 was passed through 25 generations of white mice from July 12, 1940, to December 26, 1940, an interval of 167 days, without being in contact with hosts other than the rat from which it was originally isolated (table 2). The method of passage was the same as that for strain 1653. Only one mouse survived. This animal was one of six inoculated in the eighth passage and it developed jaundice and marked edema prior to recovery. During the first 10 passages the interval between injection and death was 5 to 11 days, and from 5 to 9 days in the next 10 generations. The disease produced by this organism is the same as that caused by strain 1653.

TABLE 2.—*Serial passage of L. icterohaemorrhagiae (strain 11) in white mice*

Passage No.	Date of inoculation (1940)	Number of white mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organism isolated	Guinea pigs inoculated and Weil's disease produced
1	July 12	3	3	July 22; July 23	10–11	--------	1—typical.
2	July 23	4	4	July 30; Aug. 1	7–9	--------	1—typical.
3	Aug. 1	4	4	Aug. 8; Aug. 10	7–9	+	1—typical.
4	Aug. 9	4	4	Aug. 14; Aug. 16	5–7	+	1—typical.
5	Aug. 15	4	4	Aug. 22; Aug. 24	7–9	+	
6	Aug. 22	4	4	Aug. 27; Aug. 28	5–6	+	
7	Aug. 28	4	4	Sept. 4; Sept. 5	7–8		
8	Sept. 4	6	5	Sept. 9; Sept. 10	5–6		
9	Sept. 10	4	4	Sept. 17; Sept. 18	7–8	--------	1—typical.
10	Sept. 17	4	4	Sept. 24; Sept. 25	7–8		
11	Sept. 24	5	5	Sept. 30; Oct. 1	6–7		
12	Sept. 30	5	5	Oct. 7	7		
13	Oct. 7	5	5	Oct. 12; Oct. 14	5–7	+	
14	Oct. 12	6	6	Oct. 18; Oct. 19	6–7	+	
15	Oct. 18	5	5	Oct. 23; Oct. 25	5–7		
16	Oct. 23	7	7	Oct. 28; Oct. 30	5–7		
17	Oct. 28	10	10	Oct. 31; Nov. 4	3–7		
18	Nov. 4	10	10	Nov. 12; Nov. 13	8–9		
19	Nov. 12	5	5	Nov. 19; Nov. 20	7–8		
20	Nov. 19	5	5	Nov. 24; Nov. 26	5–7		
21	Nov. 26	4	(1)	Nov. 27	--------	+	
22	Nov. 27	5	5	Dec. 5; Dec. 8	8–11		
23	Dec. 5	8	8	Dec. 8; Dec. 11	3–6	--------	2—typical.
24	Dec. 10	8	8	Dec. 16; Dec. 17	6–7		
25	Dec. 17	5	5	Dec. 23; Dec. 26	6–9		

[1] Accidental death.

Strain 18 has been passed in mice for only a limited number of generations but the findings are in agreement with those observed for the other organisms (table 3).

TABLE 3.—*Passage of L. icterohaemorrhagiae (strain 18) in white mice*

Passage No.	Date of inoculation (1940)	Number of white mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organism isolated	Guinea pigs inoculated and Weil's disease produced
1	Nov. 19	5	5	Nov. 25; Nov. 26	6–7		
2	Nov. 26	4	(1)	--------	--------	+	
3	Nov. 27	8	8	Dec. 5; Dec. 7	8–10		
4	Dec. 5	4	4	Dec. 10; Dec. 11	5–6	--------	3—typical.
5	Dec. 11	10	10	Dec. 17; Dec. 21	6–10		
6	Dec. 18	10	10	Dec. 25; Dec. 26	7–8		

[1] Accidental death.

Recovery of *L. icterohaemorrhagiae* from sick or dead mice, and the ability of these cultures and of tissue from infected mice to produce typical evidence of leptospirosis in guinea pigs, show that the organisms involved are those which were originally injected. Leptospirae obtained from mice during the course of the experiment reacted specifically with antileptospira serum obtained from various sources. No other pathogenic organisms were encountered during the study, although occasional cultures made from infected mice were contaminated with nonpathogenic organisms.

Symptoms and signs of leptospirosis in mice.—The disease produced in mice by *L. icterohaemorrhagiae* is very characteristic and easily recognized. After an incubation period of 3 to 7 days, the mice become listless and inactive, their fur is ruffled, and the animals appear acutely ill. Icterus usually appears 1 to 2 days before death, being most marked in the ears. The eyelids, sclerae, conjunctivae, and the webs of the feet are also yellow. Yellow urine may be expressed from the bladder when jaundice is present. Extreme weakness and tremors usually are noted before death occurs. Convulsive seizures may be noted just before the animal dies.

Gross pathological lesions consist essentially of icterus of the subcutaneous tissue and kidneys, hemorrhages of various extent in the lungs, congestion of the lymph nodes, and slight damage to the liver, which in most cases is pale and soft. The hemorrhagic condition of the skin and serous membranes noted in deer mice and guinea pigs is only occasionally encountered in white mice, and then is present only to a limited degree. In the latter animals hemorrhage of the lungs is a more constant feature, but the size and frequency of occurrence vary considerably. When mice survive for a prolonged period, generalized edema may appear. This has been observed in only a few instances, and in none were gross causes for this condition noted. Microscopic examination of tissues has been done in a number of instances, and, although the lesions are not well marked, leptospirae are demonstrable in the liver and kidneys of mice suffering from leptospirosis. It is apparent that *L. icterohaemorrhagiae* can be passed in young mice for indefinite periods without loss of virulence for guinea pigs.

Routes of infection.—Mice are susceptible to leptospirosis when infected material is given intraperitoneally, subcutaneously, or orally (table 4). Although the oral route does not appear to be as efficient as the others studied, it suggests that ingestion of organisms might be the method whereby rodents may become infected in nature. It has been demonstrated (*11*) that gophers become infected after ingestion of carcasses of animals dying of leptospirosis.

Relation of age of mice to resistance against leptospirae.—Because most workers report white mice to be relatively insusceptible to

TABLE 4.—*Susceptibility of 3-week-old white mice to L. icterohaemorrhagiae administered by various routes*

Dilution	Route	Strain 18	Strain 11	Route	Strain 18	Strain 11	Route	Strain 18	Strain 11
10^{-1}	Intraperitoneal	5/0	5/0	Subcutaneous	5/0	5/0	Oral	5/0	5/0
10^{-2}	do	5/0	5/0	do	5/0	5/0	do	5/0	4/1
10^{-3}	do	5/0	5/0	do	5/0	5/0	do	3/2	3/2
10^{-4}	do	3/2	4/1	do	2/3	1/4	do	3/2	0/5

Numerator=Number of mice dying.
Denominator=Number of mice surviving.

leptospiral infections, it is indicated, in view of our results, that unsuitable mice were tested to determine susceptibility. Adult guinea pigs are more resistant to leptospirae than young ones; this is also the case among mice. Table 5 shows the results obtained

TABLE 5.—*Susceptibility of white mice of various ages to L. icterohaemorrhagiae*

Age of mice (weeks)	Number injected	Strain of leptospirae	Number of deaths in days														Total number of deaths	Percent mortality
			1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th		
3	27	11	----	----	1	----	4	8	13	1	----	----	----	----	----	----	27	100
4	30	11	----	----	1	----	----	1	21	5	2	----	----	----	----	----	30	100
5	30	11	----	----	----	----	2	1	8	7	8	1	----	----	----	----	27	90
6	30	11	----	----	----	----	----	----	6	9	5	3	2	----	----	1	26	86.6
7	30	11	----	----	1	----	----	1	7	2	5	1	1	----	1	----	19	63.3
3	27	1653	----	1	----	3	5	8	----	4	3	3	----	----	----	----	27	100
4	29	1653	----	----	----	----	----	6	8	4	----	2	1	----	----	----	21	72.4
5	30	1653	----	----	2	----	5	----	5	4	3	----	1	1	----	----	21	70.0
6	30	1653	----	----	----	----	1	----	3	3	6	2	1	1	----	----	17	56.6
7	30	1653	----	----	----	----	----	1	1	1	2	2	1	1	----	----	9	30.0

following inoculation of mice of different ages with strains 1653 and 11 of *L. icterohaemorrhagiae*. The former strain was given to mice in its eighteenth to twentieth mouse passage and the latter in its sixteenth to eighteenth generation in white mice. Intraperitoneal inoculation of 0.3 cc. doses of 10 percent infected liver and kidney emulsion was used to produce infection. This amount of material was found to be capable of producing jaundice and death in certain of the mice from 3 to 7 weeks of age. Jaundice develops most rapidly and affects all animals of the younger age group. Although it does appear in mice of the older age groups, icterus is delayed and does not manifest itself in all inoculated animals. In those 6- or 7-week-old mice which develop it, jaundice is intense. Death occurred within 10 days among all mice 3 weeks of age. There is a general tendency toward a decreasing mortality rate among mice as they become older. Among mice 7 weeks of age, the mortality rate was 63.3 percent and 30 percent, respectively, for strains 11 and 1653. The results obtained with strain 1653 are comparable to those of Inada et al. (*1*), who found 4 out of 14 mice to be susceptible and stated that this species was resistant to infection with *L. icterohaemorrhagiae*.

Distribution of deaths among mice due to leptospirosis.—The survival time increases while the death rate decreases as older mice are subjected to leptospiral infections. The survival time of 143 mice 3 weeks of age, which had been given 0.3 cc. to 0.5 cc. inocula of 10 percent infected mouse tissue intraperitoneally, is shown in table 6. All deaths occurred between the second and tenth days following inoculation, with 82.6 percent of the deaths falling between the fifth and seventh days. Reference to table 5 shows that as the age of the mice increases the interval between injection and death likewise increases. Among 4-week-old mice, 88.2 percent of deaths

caused by the leptospirae occur between the sixth and eighth days following injection; in 5-week-old mice 68.7 percent of deaths take place in 7 to 9 days; 74.4 percent of the deaths among 6-week-old mice are observed in 7 to 9 days, and 75 percent of the deaths among 7-week-old mice occur in 7 to 10 days.

TABLE 6.—*Survival time of 3-week-old mice infected with L. icterohaemorrhagiae*

Number of mice inoculated	Number of deaths in days										Percent mortality
	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	
35	-------	-------	-------	4	8	10	13	-------	-------	-------	100
20	-------	-------	-------	1	5	6	6	2	-------	-------	100
20	-------	-------	1	1	6	8	4	-------	-------	-------	100
14	-------	-------	-------	-------	11	3	-------	-------	-------	-------	100
27	-------	-------	1	-------	4	8	13	1	-------	-------	100
27	-------	1	-------	3	5	8	-------	4	3	3	100
143	-------	1	2	9	39	43	36	7	3	3	-------
Percent of total	-------	0.7	1.4	6.3	27.3	30.1	25.2	4.9	2.1	2.1	100

Titration of infective agent in infected tissue.—In titrating infected tissues of sick or dead mice the passage experiments showed that 0.2, 0.3, and 0.5 cc. amounts of 10 percent tissue produced leptospirosis in all 3-week-old mice into which they were inoculated intraperitoneally. In a series of tests in which 0.3 cc. of varying dilutions of liver and kidney emulsion made from mice dying of leptospirosis was administered to each of 30 mice 3 weeks old, it was found that 10 percent and 1 percent suspensions killed all animals injected. Only 46.6 percent of the mice died when tested against 0.1 percent suspensions and 20 percent of those tested against 0.01 percent emulsions succumbed. No mice died after receiving 0.3 cc. of 0.001 percent suspension of liver and kidney from sick mice.

Distribution of leptospirae in infected mice.—In order to determine the distribution of leptospirae in mice suffering from Weil's disease, certain organs were removed from animals dead or killed *in extremis.* The organs were weighed, ground, and made into 10 percent suspensions in saline and further serial dilutions were made to 10^{-3}. They were then injected intraperitoneally in 0.3 cc. doses into young mice. Tissues from mice infected with strains 11, 1653, and 18 were tested in this manner. Care was taken to avoid any undue contact of one organ with another during removal from the mouse. Liver, kidney, spleen, lung, and brain all contained leptospirae, as evidenced by production of jaundice and death in the test mice. In general, tissue suspensions diluted 10^{-3} with 0.9 percent salt solution contained sufficient infective material to induce Weil's disease in mice. A 10^{-4} suspension of liver tissue failed to involve mice, but similar dilutions of kidney were found to be infective. Suspensions of brain, spleen, or lung did not yield such consistent results as did those of

liver and kidney when tested at dilutions of 10^{-3}, but were equally efficient at lower dilutions. Leptospirosis is a generalized infection in white mice showing little tendency toward localization in the kidney during its acute course.

Isolation of L. icterohaemorrhagiae from wild rats.—It seemed to be of value to attempt to isolate *L. icterohaemorrhagiae* from naturally infected sources in order to test the suitability of mice for diagnostic purposes. Wild rats collected in Arlington County, Virginia, and Washington, D. C., were selected for this work. Twenty-six rats which had been trapped alive were killed with ether. Their kidneys were removed, ground with sand in a mortar, and made into a 10 percent suspension in salt solution. One guinea pig and three or four mice were inoculated intraperitoneally with 2.0 cc. and 0.5 cc., respectively, of suspension from each rat. The results of the positive tests, with the exception of those from rat 11 from which strain 11 was isolated, are given in table 7. A total of 126 mice were used to recover the organisms from nine rats, and all developed jaundice and

TABLE 7.—*Isolation of L. icterohaemorrhagiae from wild rats in white mice*

Wild rat	Number of mice			Number of days between inoculation and death of mice	Number of guinea pigs			Number of mouse passages	Cultures obtained from mice
	Inoculated	Jaundiced	Died		Inoculated	Jaundiced	Died		
A7	15	15	15	5-11	5	5	5	5	+
A8	19	19	19	8-11	7	7	7	5	+
A25	12	12	12	6-9	2	1	2	3	+
A26	12	12	12	9-12	2	2	2	3	+
A27	16	16	16	5-7	4	3	4	4	+
A33	16	16	16	6-7	5	5	5	4	+
A35	12	12	12	7-10	2	2	2	3	+
A38	12	12	12	8-10	2	2	2	3	+
A39	12	12	12	8-11	2	2	2	3	+

died in from 6 to 12 days. Cultures of *L. icterohaemorrhagiae* were made from the organs of the mice used to perpetuate the passage, and, following inoculation, mouse passage was terminated. *L. icterohaemorrhagiae* was isolated from each rat by continuous passage in mice and cultivation of liver and kidney from these mice on Verwoort's medium. Passage was made for three generations in five cases and for four and five generations in each of two other cases.

Certain advantages were gained by using mice in addition to guinea pigs in trying to isolate leptospirae from naturally infected rats. In two experiments the guinea pigs died with secondary infection before jaundice appeared and the diagnosis would not have been made if mice had not also been employed. Guinea pigs died of leptospirosis one day earlier than did mice injected with corresponding material in two cases, and on the same day in two other cases, but the mice reacted 3 to 8 days earlier in the remainder of the experiments. As a

number of mice may be used at small cost and death occurs in them as early as, or earlier than, in guinea pigs, they can be utilized as test animals in suspected cases of leptospirosis.

DISCUSSION

An experimental animal which is a natural host of any specific disease is superior to one which is not, provided natural infection is ruled out. The conclusions drawn from experiments with such an animal may be directly applicable to conditions in the field. Although rats have been found to be the most common carriers of leptospirae, this may, in part, be due to the extremely large number of surveys made concerning infection in this species of rodent. Certainly the relatively few instances in which mice have been studied have yielded evidence of leptospirosis occurring spontaneously in these animals. The general results of previous experimental work on leptospirosis in mice have suggested that mice are resistant to infection and this is probably responsible for the general lack of interest in this phas of the problem.

It has been shown that *L. icterohaemorrhagiae* causes a uniform disease picture in young white mice, which is characterized by jaundice and a high mortality rate. As young mice are so very susceptible to the disease and present material advantage over other hosts in many respects, they must be included in the list of animals suitable for experimental use in the study of Weil's disease and other leptospiroses. This is especially true when large numbers of animals are required and when the cost of guinea pigs and the unavailability of deer mice prohibit their use.

CONCLUSIONS

1. Young white mice (*Mus musculus*) are extremely susceptible to *L. icterohaemorrhagiae* and develop signs of generalized infection prior to death. The mortality rate approximates 100 percent in 3-week-old mice, but falls rapidly as age increases.

2. Infection may be induced by inoculation of organisms by intraperitoneal, subcutaneous, or oral routes.

3. Three strains of *L. icterohaemorrhagiae* originally isolated from wild rats have been maintained in mice in a fully virulent state for 27, 25, and 6 passages.

4. White mice are suitable animals for laboratory studies of leptospirosis.

REFERENCES

(*1*) Inada, R., Ido, Y., Hoki, R., Kaneko, R., and Ito, H.: The etiology, mode of infection, and specific therapy of Weil's disease (spirochetosis icterohaemorrhagica). J. Exp. Med., 23:377 (1916).

(*2*) Wirth, D.: Infektionsversuche mit Leptospiren. Wien. klin. Wchnschr., 30:1115 (1937).

———: Die Leptospirose (Weilsche Krankheit) bei Tieren. Wien. Tierarzl. Monatschr., 24:97 (1937).

(3) Noguchi, H.: Etiology of yellow fever. VIII. Presence of a Leptospira in wild animals in Guayaquil and its relation to *Leptospira icterohaemorrhagiae* and *Leptospira icteroides*. J. Exp. Med., **30**:95 (1919).
(4) Packchanian, A.: The occurrence of *Leptospira icterohaemorrhagiae* and *Spirochaeta morsus muris* in "laboratory white mice" (*Mus musculus*) at St Louis (1933) and extreme susceptibility and fatality of American deer mice (*Peromyscus*) to *Leptospira icterohaemorrhagiae*. Science, N. S., **83**:140 (1936).
(5) Hiroki, H.: Über die Übertragung der Leptospirosen auf Mause. Ztschr. f. Immunitätsforsch. u. exper. Therap., **96**:396 (1939).
(6) Langworthy, V., and Moore, A. C.: A study of *Leptospirae icterohaemorrhagiae*. J. Infect. Dis., **41**:70 (1927).
(7) Uhlenhuth, P.: Epidemiologie der Weilschen Krankheit. Acta Conventus Tertii de Tropicis Morbis, Pars I: 357–371 (1938).
(8) Walch-Sorgdrager, B.: Leptospiroses. Bull. Health Organ., League of Nations, **8**:143 (1939).
(9) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Canine leptospirosis in the United States. J. Am. Vet. Med. Assoc., **95**:710–729 (1939).
(10) Packchanian, A.: Susceptibility and resistance of certain species of American deer mice, genus *Peromyscus*, and other rodents to *Leptospira icterohaemorrhagiae*. Pub. Health Rep., **55**:1389 (1940).
(11) Syverton, J. T., Stiles, W. W., and Berry, G. P.: Epidemiological studies on Weil's disease, with notes on the susceptibility of the "gopher" *Citellus richardsoni* (Sabine) to experimental inoculation of *Leptospira icterohaemorrhagiae*. J. Bact., **36**:279 (1938).

STATISTICS ON POLIOMYELITIS IN THE TERRITORY OF HAWAII

By Richard K. C. Lee, M. D., Dr. P. H., *Deputy Territorial Commissioner of Public Health, Honolulu, Hawaii*

There is little available information in the medical literature regarding the incidence of poliomyelitis in the semitropics, or about the distribution of this disease among the various races. McKinley in his text, "A Geography of Disease" (*4*), lists infantile paralysis as a disease normally considered characteristic of temperate climates. In the section on Hawaii, the distribution of the disease is described as general for all the islands in the Territory and is indicated as an important public health problem. In this same text, although poliomyelitis is reported to be present in Puerto Rico and the Philippine Islands, the author's conclusion is that the disease was not considered an important public health problem there. During the period of the survey for this text (1935), no cases of poliomyelitis occurred in Samoa, Guam, or the Virgin Islands. Rosenau (*6*) and other public health workers also describe the disease as one of the temperate zones. Aycock (*1*) states that, as the warm climates are approached, there is less of the disease and the tendency is toward more even distribution throughout the year.

Morales (*5*) reporting on an outbreak of acute anterior poliomyelitis in Puerto Rico in 1930 states "* * * reports of epidemic poliomyelitis in the Tropics are rare * * *." The disease has existed in endemic form in Puerto Rico for some time but no epidemic had been reported

before 1928. He referred to a report of the United States Public Health Service of an epidemic of poliomyelitis in Santa Clara, Cuba (140 cases), and Sao Paulo, Brazil (13 cases), in 1909.

The information presented in this article refers particularly to the incidence and distribution of poliomyelitis. No attempt has been made to report or discuss its clinical aspects. However, from personal communications with physicians treating patients afflicted with poliomyelitis, no clinical characteristic of the disease in the Territory of Hawaii is noted which has not been previously described.

The period of this study extends over the past 11 years, including the fiscal year 1940 when the most serious epidemic of poliomyelitis occurred in these islands. Statistics prior to this period are meager and incomplete.

Prior to 1922, poliomyelitis was not reported to the Board of Health. In table 1, two columns are given for cases reported or known to the Board of Health. One is the official list of the Bureau of Communicable Diseases, which comprises cases reported annually; the list of the Bureau of Crippled Children includes these cases plus known cases of poliomyelitis not reported to the Bureau of Communicable Diseases. These unreported cases were diagnosed at clinics for crippled children, held in all counties of the Territory. The majority of these unreported cases, numbering 76, were diagnosed long after the acute stage of poliomyelitis and were referred to the clinics for crippled children because of the residual paralysis.

Table 1 also shows the incidence rate of poliomyelitis. The rate for the year 1940, 23.67 per 100,000 population, far exceeded the average rate, and was higher than the rate for any other year for which data are available.

TABLE 1.—*Cases of poliomyelitis known to the Territorial Board of Health*

Fiscal year [1]	Bureau of Communicable Diseases		Bureau of Crippled Children		Territorial population
	Cases	Rate per 100,000	Cases	Rate per 100,000	
1922	1	0.34			291,515
1923	10	3.30			302,800
1924	13	4.12			315,372
1925	3	.92			326,015
1926	1	.30			330,932
1927	29	8.52			341,093
1928	5	1.42			353,208
1929	4	1.09			368,336
1930	17	4.59			370,620
1931	27	7.19	26	6.93	375,211
1932	16	4.20	23	6.04	380,597
1933	7	1.84	12	3.16	380,211
1934	14	3.69	9	2.37	378,948
1935	4	1.04	17	4.42	384,437
1936	43	10.93	13	3.31	393,277
1937	8	2.02	51	12.86	396,715
1938	10	2.43	30	7.29	411,485
1939	10	2.41	34	8.19	414,991
1940	101	23.67	101	23.67	426,654

[1] Ended June 30.

Except for the islands of Lanai and Niihau, poliomyelitis was reported from all islands in the Territory. Although it has been described as a disease of rural areas, the majority of reported cases occurred on Oahu which includes Honolulu City.

TABLE 2.—*Poliomyelitis cases and deaths, by islands, 1930–40*

Fiscal year	Oahu		Hawaii		Maui		Kauai		Molokai		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1930	11	-------	7	-------	-------	-------	-------	-------	-------	-------	18	-------
1931	15	-------	10	-------	-------	-------	-------	-------	1	-------	26	-------
1932	21	-------	1	-------	1	-------	-------	-------	-------	-------	23	-------
1933	8	-------	3	-------	-------	-------	-------	-------	1	-------	12	-------
1934	7	-------	2	-------	-------	-------	-------	-------	-------	-------	9	-------
1935	12	-------	3	-------	2	-------	-------	-------	-------	-------	17	-------
1936	5	-------	7	-------	-------	-------	1	-------	-------	-------	13	-------
1937	26	1	13	-------	10	-------	2	-------	-------	-------	51	1
1938	19	-------	4	1	4	-------	2	-------	1	-------	30	1
1939	23	6	3	-------	6	-------	1	-------	1	-------	34	6
1940	65	-------	25	1	8	-------	3	-------	-------	-------	101	1
Total	212	7	78	2	31	-------	9	-------	4	-------	334	9

During the fiscal year 1940 the island of Hawaii reported the highest rate per 100,000 population, 32.75, with Oahu second with a rate of 25.22, while the average rate for the Territory was 23.39. Kauai had a low rate of 8.42 per 100,000. Considering the period from 1930 to 1940, the highest case rate was reported in 1940, 23.67 per 100,000, and the lowest in 1934, 2.37. The second highest rate, 12.86, was for the year 1937. These figures are significant when they are compared with those of the mainland. The highest rate in the United States, 41.4 per 100,000 population, occurred in 1916, and the lowest, 1.3, in 1938. The second highest rate during the period from 1915 to 1938 was for 1931, 14.6 per 100,000. (See Public Health Reports for May 26, 1939, page 857.) The average for the 5 years 1934–38 was 5.32 per 100,000. The highest rate reported during this 5-year period was for the District of Columbia, 14.3 per 100,000 in 1935.

Table 3 shows the number of cases of poliomyelitis reported in Hawaii, by months, during the fiscal years 1930 to 1940. It is seen that, over the 10-year period 1930–39, the months of February, March, April, May, and June are particularly high, while during the epidemic year, 1940, May, June, July, and August are the high months. It is also noted that during these 11 years cases were reported more frequently in the months of March, April, May, and June than in any other group of months.

TABLE 3.—*Cases of poliomyelitis reported in Hawaii, 1930–40, by months*

Month	Fiscal year											Total
	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	
July	0	1	4	2	1	0	0	0	2	2	14	26
August	1	3	2	1	1	0	3	0	1	0	11	23
September	1	2	6	0	0	1	0	1	2	1	5	19
October	0	3	2	1	0	1	2	0	0	1	4	14
November	1	0	0	1	2	1	0	4	3	1	5	18
December	1	1	0	3	0	0	2	10	5	5	12	39
January	2	0	0	0	0	0	1	4	3	2	8	20
February	2	3	0	0	3	0	0	11	6	3	9	37
March	4	1	2	1	0	8	1	5	5	3	3	33
April	5	5	3	1	0	1	1	2	0	3	6	27
May	1	4	1	1	1	4	0	8	2	7	15	44
June	0	3	3	1	1	1	3	6	1	6	9	34
Total	18	26	23	12	9	17	13	51	30	34	101	334

Infantile paralysis is a warm-weather disease but spares warm countries. In temperate countries the number of cases rises in July, reaches its peak in August and September, and declines with the advent of cold weather. This seasonal periodicity repeats itself with marked regularity in all endemic regions of the temperate zone. In Kentucky during the period from 1917 to 1935, the highest incidence occurred during the months of July, August, September, and October (*3*). In Massachusetts, from 1916 to 1934, the highest incidence occurred during these same months (*6*). However, table 3 bears out Aycock's statement that in warm climates poliomyelitis has a tendency to be more evenly distributed throughout the year.

The primary purpose of this paper is to report rates of poliomyelitis among the racial groups in the Territory of Hawaii; the cosmopolitan population of the Territory offers a fertile field for epidemiological study. For many years we have been impressed by the high rate of poliomyelitis among the Caucasian population as compared to that among other racial groups. This was particularly noted during the epidemic year of 1940 when the rate for this racial group was 43.5 per 100,000 as compared to the average rate of 23.67 for the entire Territory. Low rates were reported for Filipinos, 7.67 per 100,000; Chinese, 10.41; and Japanese, 15.93. These figures are more or less borne out by the study of rates of crippled children with poliomyelitis in the register of the Bureau of Crippled Children. High rates are particularly noted in the Caucasian and Hawaiian and part-Hawaiian groups, being 57.38 and 79.64 per 100,000, respectively; Filipinos are lowest with a rate of 24.93 and the rate for Chinese is 34.71 per 100,000. These latter rates are cumulative, since poliomyelitis cases in the crippled-children register include old and new cases of all children with crippling deformities from infancy to 21 years of age.

TABLE 4.—*Racial distribution of cases of poliomyelitis in Hawaii*

Racial descent	Territorial population	Poliomyelitis cases	Rates per 100,000
(a) FISCAL YEAR ENDED JUNE 30, 1940			
Hawaiian and part Hawaiian	65,291	17	26.04
Caucasian	108,055	47	43.5
Puerto Rican	7,781	2	25.7
Chinese	28,809	3	10.41
Japanese	156,849	25	15.93
Korean	6,761	3	44.37
Filipino	52,148	4	7.67
Others	960		
Total	426,654	101	23.67
(b) YEARS 1930-40, INCLUSIVE [1]			
Hawaiian and part Hawaiian	57,688	5.6	9.71
Caucasian	81,055	7.0	8.64
Puerto Rican	7,368	.2	2.71
Chinese	27,264	1.2	4.40
Japanese	148,972	7.2	4.83
Korean	6,668	.2	3.0
Filipino	54,668	1.7	3.11
Others	754	.2	26.53
Total	384,437	23.3	6.06
(c) POLIOMYELITIS CASES REGISTERED WITH THE BUREAU OF CRIPPLED CHILDREN AS OF JUNE 30, 1940			
Hawaiian and part Hawaiian	65,291	52	79.64
Caucasian	108,055	62	57.38
Puerto Rican	7,781	3	38.56
Chinese	28,809	10	34.71
Japanese	156,849	71	45.27
Korean	6,761	3	44.37
Filipino	52,148	13	24.93
Others	960	3	312.50
Total	426,654	217	

NOTE.—Population figures compiled by the Bureau of Vital Statistics are subject to correction by the Federal Census of 1940.

[1] Population figures as of 1935.

In attempting to explain the high rates among the Caucasian group, it might be assumed that this group was more frequently exposed to the disease, which may have been brought to Hawaii from the mainland. However, the majority of cases in this racial group are among children born and reared here, and only a small number occur among those who have recently arrived from the mainland. The high rates cannot be attributed to nutritional status because the Caucasian group in general enjoys much better nutrition, housing, and sewage disposal facilities. I do not believe that there is a particular racial immunity to poliomyelitis. This might, of course, have some bearing, but, in my opinion, environmental opportunity or exposure to sources of infection is a more likely factor. Island children of Caucasian ancestry are doubtless more frequently exposed to recent mainland arrivals than those of other racial groups.

As shown in table 5, among Caucasians there is a wider distribution of poliomyelitis throughout all age groups, and particularly the older age groups. Of the 11 cases reported in persons over 20 years of age, 9 were among Caucasians, and the other 2 were in Japanese. This bears out Aycock's statement that there has been a gradual shift toward the occurrence of poliomyelitis in older age groups in both urban and rural populations in the last 20 years. This has been commented on by a number of observers in recent years, and has been considered by some as representing a major, but as yet inexplicable, change in the epidemiological behavior of the disease. However, among Japanese, Chinese, Koreans, and Filipinos, the largest number of cases occurs among children from 1 to 5 years of age. A total of 49 out of the 101 cases reported was among children of these ages. The distribution here is similar to that in other epidemics and reported studies.

TABLE 5.—*Cases of poliomyelitis reported in Hawaii during the fiscal year 1940, by age*

Race	Age at time of onset						Total
	Under 1 year	1–5	5–10	10–15	15–20	20 and over	
Hawaiian and part Hawaiian	2	12		3			17
Caucasian	5	17	5	8	3	9	47
Puerto Rican		1		1			2
Japanese	1	12	8	2		2	25
Chinese		1	1		1		3
Korean		2	1				3
Filipino		4					4
Total	8	49	15	14	4	11	101

During the epidemic year 1940, 81.19 percent of the cases reported occurred in persons under 14 years of age, 8.91 percent in the age group 14–21 years, and 9.9 percent in the group over 21 years of age. During the 11-year period from 1930 to 1940, of a total of 334 cases, 269, or 80.53 percent, occurred in the group under 14 years, 48, or 14.37 percent, in the 14–21-year group, and 17, or 5.09 percent, in persons over 21 years of age.

In this study the youngest poliomyelitis patient was 3 months old and the oldest patient was 69 years. Rosenau reports that 65 percent of all cases of this disease usually occur in children under 5 years of age and 95 percent in those under 10 years.

TABLE 6.—*Poliomyelitis cases reported in Hawaii, 1930–40, by age*

Age	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	Total
Under 14	16	25	22	12	8	15	12	31	20	26	82	269
14–21	2	1				1		20	9	6	9	48
Over 21			1		1	1	1		1	2	10	17
Total	18	26	23	12	9	17	13	51	30	34	101	334

TABLE 7.—*Age range of poliomyelitis patients, 1930–40*

Year	Youngest	Oldest	Year	Youngest	Oldest
		Years			*Years*
1930	5 months	19	1936	5 years 3 months	29
1931	8 months	19	1937	10 months	20
1932	1 year	29	1938	7 months	27
1933	1 year 5 months	13	1939	11 months	23
1934	3 years	27	1940	3 months	38
1935	1 year 7 months	69			

TABLE 8.—*Poliomyelitis cases reported in Hawaii, 1930–40, by sex*

Fiscal year	Oahu		Hawaii		Maui		Kauai		Molokai		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1930	8	3	3	4	0	0	0	0	0	0	11	7
1931	11	4	5	5	0	0	0	0	1	0	17	9
1932	14	7	------	1	1	0	0	0	0	0	15	8
1933	4	4	2	1	0	0	0	0	0	1	6	6
1934	4	3	2	0	0	0	0	0	0	0	6	3
1935	6	6	2	1	1	1	0	0	0	0	9	8
1936	3	2	3	4	0	0	1	0	0	0	7	6
1937	15	11	9	4	6	4	1	1	0	0	31	20
1938	10	9	3	1	2	2	0	2	1	0	16	14
1939	14	9	3	0	4	2	0	1	1	0	22	12
1940	44	21	14	11	6	2	2	1	0	0	66	35
Total	133	79	46	32	20	11	4	5	3	1	206	128

During the epidemic year 1940, 65.35 percent of the reported cases were among males and 34.65 percent among females. During the 11-year period 1930–40, 206 of the cases were among males and 128 among females, a percentage ratio of 62 : 38. Rosenau reports that on the average 56 percent of poliomyelitis cases are in males as compared to 44 percent in females.

CONCLUSION

Statistical material is presented showing the distribution of poliomyelitis in the Territory of Hawaii since 1922, with special reference to the outbreak during the fiscal year 1940. The data presented in this paper indicate the extent of the disease in the semitropics. As poliomyelitis is described as a disease of the temperate zones, this additional information, including the racial distribution, may throw light on some of the unsolved problems in the epidemiology of poliomyelitis.

No attempt has been made to describe the clinical characteristics of poliomyelitis in Hawaii as there appears to be little dissimilarity from cases reported elsewhere.

The racial distribution and the particularly high rates among the Caucasian population may be of interest in the epidemiology of the disease. This may be due to an increase in travel from the mainland to the Territory during this period.

Infantile paralysis in the Territory of Hawaii is definitely a public health problem, and with increasing migration to Hawaii its rate of occurrence is likely to increase.

REFERENCES

(1) Aycock, W. L.: The Epidemiology of Poliomyelitis. In Virus and Rickettsial Diseases. Harvard University Press, 1940.
(2) Dauer, C. E.: Studies on the epidemiology of poliomyelitis. Pub. Health Rep., 53:1003 (June 24, 1938).
(3) Lumsden, L. L.: Epidemiological Studies of Poliomyelitis in Kentucky. Public Health Bulletin No. 228, U. S. Government Printing Office, 1936.
(4) McKinley, E. B.: A Geography of Disease. George Washington University Press, 1935.
(5) Morales, E. Garrido: Acute anterior poliomyelitis at Vega Baja, Puerto Rico. J. Infect. Dis., 46 : 31 (January 1930).
(6) Rosenau, M. J.: Preventive Medicine and Hygiene. 6th Ed. D. Appleton Century Co., 1935.

REPORT ON MARKET-MILK SUPPLIES OF STANDARD MILK ORDINANCE COMMUNITIES [1]

Compliance of the Market-Milk Supplies of Certain Standard Milk Ordinance Communities With the Grade A Pasteurized and Grade A Raw Milk Requirements of the Public Health Service Milk Ordinance and Code, as Shown by Compliance (Not Safety) Ratings of 90 Percent or More Reported by the State Milk-Sanitation Authorities During the Period July 1, 1939, to June 30, 1941

The accompanying list gives the sixteenth semiannual revision of the list of certain Standard Milk Ordinance communities in which the pasteurized market milk is both produced and pasteurized in accordance with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code and in which the raw market milk sold to the final consumer is produced in accordance with the Grade A raw milk requirements of said ordinance and code, as shown by ratings of 90 percent or more reported by State milk-sanitation authorities.

These ratings are not a complete measure of safety, but represent the degree of compliance with the Grade A requirements of the Public Health Service Milk Ordinance and Code. Safety estimates should also take into account the percentage of milk pasteurized, which is given in the following tables.

The milk ordinance recommended by the Public Health Service is now in effect in hundreds of communities ranging in population from 1,000 to 3,500,000 and located in 34 States.

The primary reason for publishing the rating lists from time to time is to encourage these communities to attain and maintain a high level of excellence in the enforcement of this ordinance. No comparison with communities operating under other milk ordinances is intended or implied.

[1] From the States Relations Division.

It is emphasized that the Public Health Service does not intend to imply that only those communities on the list are provided with high-grade milk supplies. Some communities which have high-grade milk supplies are not included, because arrangements have not been made for the determination of their ratings by the State milk-sanitation authority. In other cases the ratings which have been determined are now more than 2 years old and have therefore lapsed. In still other communities with high-grade milk supplies there seems, in the opinion of the community, to be no local necessity nor desire for rating or inclusion in the list, nor any reasonable local benefit to be derived therefrom.

The rules under which a community is included in this list are as follows:

(1) All ratings must have been determined by the State milk-sanitation authority in accordance with the Public Health Service rating method (Pub. Health Rep., **53:** 1386 (1938). Reprint No. 1970), based upon the Grade A pasteurized milk and the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code.

(2) No community will be included in the list unless both its pasteurized milk and its raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the raw milk ratings are 90 percent or more. Communities which receive, without local inspection, milk from other sheds will be included in the list only if the locally inspected supply, as well as the shipped-in supply, shows a rating of 90 percent or more.

(3) The rating used will be the latest rating submitted to the Public Health Service, but no rating will be used which is more than 2 years old. In order to promote continuous rigid enforcement rather than occasional "clean-up campaigns" it is suggested that when the rating of a community on the list falls below 90 percent no resurvey be made for at least 6 months, resulting in removal from the next semiannual list.

(4) The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. If such check rating is less than 90 percent but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary interim shows a rating of 90 percent or more. If, however, such check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for a period of 2 years from the date of the check survey unless a subsequent rating submitted during this period warrants its removal.

Communities are urgently advised to bring their ordinances up to date at least every 5 years, since ratings will be made on the basis of later editions if those adopted locally are more than 5 years old.

Communities which are not now on the list and desire to be rated should request the State milk-sanitation authority to determine their ratings and, if necessary, should improve their status sufficiently to merit inclusion in the list.

Communities which are now on the list should not permit their ratings to lapse, as ratings more than 2 years old cannot be used.

State milk-sanitation authorities who are not now equipped to determine municipal ratings are urged, in fairness to their communities, to equip themselves as soon as possible. The personnel required is small, as in most States one milk specialist is sufficient for the work.

The inclusion of a community in this list means that the pasteurized milk sold in the community, if any, is of such a degree of excellence that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A pasteurized milk is 90 percent or more and that, similarly, the raw milk sold in the community, if any, so nearly meets the requirements that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A raw milk is 90 percent or more. However, high-grade pasteurized milk is safer than high-grade raw milk, because of the added protection of pasteurization. To secure this added protection, those who are dependent on raw milk can pasteurize the milk at home in the following simple manner: Heat the milk over a hot flame to 165° F., stirring constantly; then immediately place the vessel in cold water and continue stirring until cool.

TABLE 1.—*Standard Milk Ordinance communities in which all market milk is pasteurized. In these communities market milk complies with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized milk ratings of 90 percent or more* [1]

Community	Percentage of milk pasteurized	Date of rating	Community	Percentage of milk pasteurized	Date of rating
ILLINOIS			MISSOURI		
Aurora	100	May 3, 1940	St. Louis	100	June 7, 1940
Brooklyn	100	Mar. 22, 1940			
Canteen	100	Do.	NORTH CAROLINA		
Centerville	100	Do.			
East St. Louis	100	Do.	Clinton	100	June 5, 1940
Elgin	100	July 12, 1940	Fort Bragg	100	June 4, 1940
Fairmont City	100	Mar. 22, 1940	Greenville	100	June 15, 1940
National City	100	Do.	Sylva	100	May 10, 1940
Stites	100	Do.			
MINNESOTA					
Rochester	100	May 29, 1941			
Winona	100	Sept. 1940			

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

TABLE 2.—*Standard Milk Ordinance communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more* [1]

[NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Percentage of milk pasteurized	Date of rating
ALABAMA		
Dothan	84	June 23, 1941.
Tuscaloosa	86	May 24, 1940.
ARKANSAS		
El Dorado	39	June 1940.
Fayetteville	60	November 1940.
Fort Smith	48	September 1940.
Jonesboro	59	October 1940.
Little Rock	50	Do.
Osceola	42	January 1940.
Pine Bluff	25	June 1940.
Texarkana	47	September 1940.
COLORADO		
La Junta	27	March 1941.
Pueblo	59	April 1941.
FLORIDA		
Coral Gables	97	April 1940.
Dania	95	Mar. 28, 1940.
Deerfield	95	Do.
Fort Lauderdale	95	Do.
Hollywood	95	Do.
Jacksonville	78	April 1941.
Miami	97	April 1940.
Pompano	95	Mar. 28, 1940.
Tallahassee	38	August 1940.
GEORGIA		
Statesboro	40	Mar. 14, 1940.
ILLINOIS		
Chicago	99.8	Apr. 11, 1941.
Decatur	92	Oct. 3, 1940.
Evanston [2]	99.9	Apr. 17, 1940.
Glenco	99.8	Apr. 11, 1940.
Highland Park	99.8	Do.
Kenilworth	99.8	Do.
Lake Bluff	99.8	Do.
Lake Forest	99.8	Do.
Oak Park	99.8	Jan. 17, 1941.
Peoria	97	May 23, 1940.
Waukegan	99.9	Apr. 3, 1940.
Winnetka	99.8	Apr. 11, 1940.
KANSAS		
Chanute	40	May 1940.
Lawrence	69	Do.
Wellington	54	April 1940.
Wichita	75	December 1939.
KENTUCKY		
Bowling Green	68	June 12, 1941.
Henderson	45	June 11, 1940.
Lexington	66	September 1940.
Louisville	99.2	November 1940.
Paducah	83	February 1941.
Richmond	28	Jan. 14, 1941.
Somerset	9	November 1940.
LOUISIANA		
Monroe	41	Mar. 7, 1941.
MICHIGAN		
Crystal City	41	July 24, 1940.
Iron River	51	Do.
Stambaugh	51	Do.
MINNESOTA		
Moorhead	88	Feb. 14, 1941.
MISSOURI		
Clayton	(3)	Dec. 14, 1939.
Ferguson	(3)	Do.
Glendale	(3)	Do.
Kirkwood	(3)	Do.
Maplewood	(3)	June 7, 1940.
University City	(3)	Dec. 14, 1939.
Webster Groves	(3)	Do.
NEW MEXICO		
Albuquerque	72	Nov. 30, 1940.
Las Vegas	65	July 25, 1939.
Roswell	77	Aug. 8, 1939.
Santa Fe	44	December 1939.
NORTH CAROLINA		
Asheville	66	June 14, 1940.
Black Mountain	24	May 21, 1940.
Durham	91	October 1940.
Fayetteville	55	June 4, 1940.
Franklin	85	July 19, 1939.
Greensboro	86	August 1940.
Goldsboro	62	June 5, 1940.
Hendersonville	73	June 26, 1940.
Hope Mills	25	June 4, 1940.
Kinston	12	July 9, 1940.
Lumberton	36	May 29, 1940.
Mars Hill	15	Jan. 10, 1941.
Rockingham	53	Apr. 9, 1940.
Roxboro	36	July 2, 1940.
Tryon	49	July 24, 1939.
Waynesville	60	May 9, 1940.
Weaverville	40	June 5, 1940.
Winston-Salem	78	November 1939.
NORTH DAKOTA		
Fargo	90.8	Feb. 16, 1941.
Valley City	23	Nov. 10, 1939.
OHIO		
Athens	80	July 6, 1940.
OKLAHOMA		
Ada	55	June 27, 1940.
Bartlesville	45	Dec. 19, 1939.
Blackwell	35	Nov. 28, 1939.
Muskogee	82	June 4, 1940.
Okmulgee	60	July 22, 1940.
Seminole	63	Mar. 26, 1940.
Tulsa	74	Apr. 6, 1940.
Wewoka	52	July 8, 1940.

See footnotes at end of table.

TABLE 2.—*Standard Milk Ordinance communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more*—Continued

Community	Percentage of milk pasteurized	Date of rating	Community	Percentage of milk pasteurized	Date of rating
OREGON			TEXAS—continued		
Astoria	78	June 20, 1941.	San Antonio	82	June 28, 1940.
Eugene	60	Nov. 1, 1940.	Seguin	19	Dec. 11, 1940.
Portland	82	Apr. 3. 1940.	Sherman	53	Mar. 25, 1941.
Seaside	68	June 20, 1941.	Texarkana	45	Feb 4, 1941.
			Tyler	42	June 12, 1940.
SOUTH CAROLINA			UTAH		
Walterboro	26	Dec. 6, 1939.	Salt Lake City	96	Dec. 24, 1940.
TENNESSEE			VIRGINIA		
Bristol	69	July 14, 1939.	Abingdon	38	Mar. 21, 1941.
Memphis	96	December 1940.	Bristol	69	July 14, 1939.
TEXAS			Lexington	41	Oct. 26, 1939.
			Pulaski	77	Sept. 20, 1939.
Amarillo	78	Aug. 12, 1940.	South Boston	75	May 29, 1941.
Big Spring	53	Aug. 8, 1940.	Waynesboro	95	Oct. 11, 1939.
Brownwood	64	May 31, 1941.	Williamsburg	55	May 26, 1941.
Bryan	14	July 20, 1940.	WASHINGTON		
Canyon	42	Aug. 9, 1940.			
Crystal City	39	June 27, 1940.			
Dallas	85	Dec. 7, 1940.	Camas	6	June 18, 1941.
Fort Worth	82	June 19, 1941.	Vancouver	28	Nov. 28, 1940.
Jacksonville	85	May 2, 1940.	Walla Walla	61	May 28, 1941.
Kerrville	74	Sept. 6, 1939.	Yakima	72	May 14, 1941.
Lamesa	47	Mar. 26, 1941.			
Lubbock	76	Oct. 28, 1939.	WYOMING		
Lufkin	43	Aug. 1, 1940.			
Palestine	23	Jan. 30, 1940.	Casper	61	Nov. 15, 1940.
San Angelo	65	May 13, 1940.	Cheyenne	66	Oct. 20, 1940.

1 Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

2 Has not adopted the milk ordinance recommended by the Public Health Service.

3 The percentage of the total milk supply pasteurized cannot be accurately determined owing to the overlapping of milk routes.

TABLE 3.—*Standard Milk Ordinance communities in which no market milk is pasteurized, but in which the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by raw milk ratings of 90 percent or more* [1]

[NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Date of rating	Community	Date of rating
ALABAMA		NORTH CAROLINA—con.	
Bridgeport	May 27, 1941.	Mount Olive	June 5, 1940.
Demopolis	Oct. 23, 1940.	Murfreesboro	July 17, 1940.
Lanett	Mar. 19, 1940.	Parmele	June 20, 1940.
Scottsboro	May 27, 1941.	Raeford	May 20, 1940.
Stevenson	Do.	Red Springs	May 29, 1940.
		Rich Square	July 16, 1940.
FLORIDA		Robersonville	June 20, 1940.
		Rosehill	May 23, 1940.
Apalachicola	January 1940.	Scotland Neck	July 16, 1940.
		Wallace	May 23, 1940.
KANSAS		Warsaw	Do.
Horton	June 1940.	Weldon	July 16, 1940.
		Williamston	June 20, 1940.
MISSOURI		Winton	July 17, 1940.
Brentwood	June 7, 1940.	SOUTH CAROLINA	
NORTH CAROLINA		Hartsville	Nov. 9, 1939.
Angier	June 6, 1940.	TEXAS	
Bethel	May 15, 1940.	Colorado	Nov. 3, 1939.
Brevard	July 28, 1939.	Del Rio	June 29, 1940.
Calypso	May 23, 1940.		
Coats	June 6, 1940.	VIRGINIA	
Dunn	Do.		
Elkin	Sept. 18, 1939.	Blackstone	May 29, 1941.
Erwin	June 6, 1940.	Boydton	Apr. 4, 1941.
Faison	May 23, 1940.		
Farmville	May 15, 1940.	WEST VIRGINIA	
Jackson	July 16, 1940.		
Kenansville	May 23, 1940.	Grantsville	May 12, 1941.
Lillington	June 6, 1940.		

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables This percentage is an important factor to consider in estimating the safety of a city's milk supply.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

June 15–July 12, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended July 12, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—A further decline in the number of cases of influenza was reported during the 4 weeks ended July 12, but the number of cases (3,471) was about 2.4 times the incidence recorded for the corresponding period in 1940 and also of the 1936–40 median, which is represented by the 1940 figure (1,452 cases). Texas in the West

South Central region and California in the Pacific region seemed to be mostly responsible for the relatively high incidence in those regions, while Arizona in the Mountain region and Virginia and South Carolina in the South Atlantic region placed those regions on a level slightly above the normal seasonal expectancy. For the country as a whole the current incidence is the highest recorded for this period in the 13 years for which these data are available.

Measles.—Measles also remained at a relatively high level, the current incidence (44,796 cases) being the highest recorded for this period in recent years. Each section of the country except the Pacific contributed to the high incidence of this disease, the increases over the normal seasonal incidence varying from 1.1 times the 1936–40 median in the New England region to 4.6 times the median in the South Atlantic region. In the Pacific region the number of cases was considerably below the seasonal average.

Meningococcus meningitis.—While the number of cases of meningococcus meningitis was considerably higher than the number reported for this period in 1940, the incidence for the country as a whole stood at about the normal seasonal level. More than 60 percent of the total cases were reported from 9 States, viz, New York, 22 cases; Maryland, 15; Massachusetts, 10; Georgia, 9; West Virginia, 8; and New Jersey, Virginia, Texas, and California, 7 cases each.

Poliomyelitis.—For the 4 weeks ended July 14, Georgia reported 91 cases of poliomyelitis; Alabama, 75; Florida, 42; California, 25; and South Carolina and Illinois, 21 cases each. More than 65 percent of the total number of cases (415) reported occurred in those 6 States. For the country as a whole the incidence was only about 40 percent above the 1936–40 median for this period, but in the South Atlantic region the number of cases (167) was more than 6 times the median, and in the East South Central region the number of cases (111) was almost 3 times the normal seasonal expectancy. In other regions the situation remained favorable, only about the normal seasonal incidence being reported. An increase in this disease is normally expected at this time of the year.

Whooping cough.—Whooping cough still maintained a comparatively high level. For the current period the reported cases totaled 16,568, as compared with approximately 13,000 cases in 1940 and a median of approximately 15,000 cases. Of the 9 geographic regions, the West North Central, South Atlantic, West South Central, Mountain, and Pacific regions reported excesses over the normal seasonal incidence, while the New England, Middle Atlantic, East North Central, and East South Central regions reported a relatively low incidence.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period June 15–July 12, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period, 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	637	623	1,145	3,471	1,452	1,452	44,796	23,946	23,946
New England	15	11	23	4	8	7	4,468	5,202	3,929
Middle Atlantic	93	103	208	13	30	23	14,330	6,666	8,422
East North Central	117	114	235	101	160	136	11,255	5,810	5,810
West North Central	57	45	83	42	19	108	1,603	1,168	950
South Atlantic	119	80	164	622	546	339	7,845	967	1,694
East South Central	46	45	78	82	73	91	1,218	720	547
West South Central	89	82	141	1,118	373	380	1,795	1 035	859
Mountain	47	66	66	199	99	74	978	1,137	758
Pacific	54	77	94	1,290	144	95	1,304	1,241	1,942
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	151	89	150	415	301	301	5,053	5,703	6,366
New England	11	1	5	2	5	6	519	435	649
Middle Atlantic	35	15	34	24	4	18	1,506	1,858	1,858
East North Central	12	15	25	33	35	35	1,612	1,984	1,984
West North Central	6	6	12	17	30	13	345	366	510
South Atlantic	47	15	35	167	24	27	275	266	288
East South Central	14	14	38	111	16	41	211	181	135
West South Central	10	13	13	24	31	31	118	129	129
Mountain	4	2	3	6	9	9	132	128	217
Pacific	12	8	8	31	147	44	335	356	450
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	84	158	479	843	857	1,369	16,568	13,121	[3] 15,178
New England	0	0	0	21	22	22	941	794	990
Middle Atlantic	0	0	0	74	89	95	2,640	2,621	3,965
East North Central	28	36	104	109	78	100	3,182	2,702	4,117
West North Central	26	71	188	36	58	58	1,418	725	725
South Atlantic	1	3	4	163	188	415	2,503	1,887	2,298
East South Central	6	11	11	123	98	267	581	534	619
West South Central	4	21	21	256	256	348	1,568	1,453	1,453
Mountain	8	10	81	32	26	54	1,352	844	844
Pacific	11	6	60	29	42	53	2,383	1,561	1,276

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] 3-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The diphtheria incidence during the 4 weeks ended July 12 was slightly higher than during the corresponding period in 1940, but the number of cases reported (637) was only about 55 percent of the 1936–40 median figure for this period. The West North Central and South Atlantic regions reported significant increases over last year, while in the New England and South Central regions the current figures closely approximated those of 1940; in the Middle Atlantic, Mountain, and Pacific regions the disease was considerably less prevalent. In each region, however, the number of cases was lower than the average incidence for this period.

Scarlet fever.—For the current period there were 5,053 cases of scarlet fever reported, as compared with 5,703, 4,702, and 6,366 cases for the corresponding period in the years 1940, 1939, and 1938, respectively. The relatively high incidence in the East South Central region was due largely to an unusually high incidence in Kentucky, 110 cases, as compared with an average of approximately 50 cases for the corresponding period in the 5 preceding years. The numbers of cases reported from all other regions were comparatively low.

Smallpox.—The incidence of smallpox was also low. For the current period there were 84 cases reported, about 50 percent of the number reported for this period in 1940 and less than 20 percent of the normal seasonal expectancy. For the country as a whole, as well as for most of the geographic regions, the current incidence was the lowest on record for this period.

Typhoid fever.—The number of cases (843) of typhoid fever was only slightly lower than the number reported for this period in 1940, but it was less than 50 percent of the preceding 5-year average incidence. The situation was favorable in all sections of the country, each section except the East North Central, where only a slight increase occurred, reporting a relatively low incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended July 12, based on data received from the Bureau of the Census, was 11.0 per 1,000 inhabitants. This rate represented a slight increase over the average rate of 10.5 for the corresponding period in the 3 preceding years.

DEATHS DURING WEEK ENDED JULY 19, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended July 19, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,218	7,468
Average for 3 prior years	7,308	
Total deaths, first 29 weeks of year	253,123	253,035
Deaths per 1,000 population, first 29 weeks of year, annual rate	12.2	12.2
Deaths under 1 year of age	496	464
Average for 3 prior years	485	
Deaths under 1 year of age, first 29 weeks of year	15,163	14,533
Data from industrial insurance companies:		
Policies in force	64,382,355	65,106,173
Number of death claims	11,973	10,834
Death claims per 1,000 policies in force, annual rate	9.7	8.7
Death claims per 1,000 policies, first 29 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 26, 1941

Summary

A total of 302 cases of poliomyelitis was reported for the current week, as compared with 246 for the preceding week. Seventy percent of these cases occurred in the South Atlantic and East South Central States, where Georgia, with 79 cases, and Alabama, with 58, reported 45 percent of the total for the week. Slight increases were recorded for some of the northern States, and increased incidence was shown for all geographic areas except the South Atlantic. The largest number of cases reported in the northern States was 11 each for New York (4 in New York City) and Ohio (8 in Cleveland).

Sixty-five cases of encephalitis were reported in North Dakota, making a total of 121 cases since July 1.

Of 73 cases of endemic typhus fever, 23 were reported in Georgia, 18 in Texas, 8 in Alabama, 7 in Oklahoma, 6 in Florida, and 5 in New York City. A total of 906 cases has been reported this year to date, as compared with 731 for the corresponding period last year and 1,224 for the same period in 1939. The highest incidence of the disease is recorded for the last six months of the year.

Of 19 cases of Rocky Mountain spotted fever reported during the week, 11 occurred in the States east of the Rocky Mountains and 8 cases in the Mountain and Pacific States. The total to date is 327 as compared with 254 cases for the same period last year.

The death rate for the current week for 88 large cities in the United States is 10.6 per 1,000 population, as compared with 10.1 for the preceding week and with a 3-year (1938–40) average of 10.7. The cumulative rate to date is 12.2, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940	
NEW ENG.												
Maine	0	0	0	------	------	------	29	44	23	0	0	0
New Hampshire	0	0	0	------	------	------	3	0	2	0	0	0
Vermont	0	2	0	------	------	------	32	9	9	0	0	0
Massachusetts	2	1	2	------	------	------	178	391	106	2	1	1
Rhode Island	3	0	0	------	------	------	10	31	6	0	0	0
Connecticut	0	1	2	------	2	1	72	16	18	0	0	0
MID. ATL.												
New York [1]	7	10	16	[2] 4	[2] 4	[2] 3	355	561	354	5	5	5
New Jersey [3]	0	6	6	2	------	1	183	290	125	0	0	0
Pennsylvania	2	8	10	------	------	------	304	170	170	1	2	4
E. NO. CEN.												
Ohio	5	4	5	1	2	5	195	21	50	1	0	0
Indiana	2	11	9	8	3	3	27	12	8	0	1	1
Illinois	17	17	20	------	6	6	77	104	36	0	1	3
Michigan [4]	1	0	7	------	------	------	133	366	128	0	1	1
Wisconsin	0	1	0	6	6	9	280	356	73	3	0	0
W. NO. CEN.												
Minnesota	0	0	0	2	1	1	10	13	13	0	0	0
Iowa	1	2	4	1	------	------	34	25	20	0	1	0
Missouri [3]	2	2	2	2	------	6	32	8	8	0	2	1
North Dakota [5]	3	18	1	------	------	------	14	3	3	0	1	0
South Dakota [3]	1	0	1	------	------	------	2	4	1	0	0	0
Nebraska	1	0	0	------	------	------	11	8	5	0	0	0
Kansas	4	1	2	2	4	2	28	33	13	1	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	2	2	2	0	0	0
Maryland [3 4]	1	1	8	1	------	1	147	2	11	2	0	0
Dist. of Col.[3]	0	2	2	------	------	------	14	2	6	0	1	1
Virginia [1 3]	6	3	4	52	25	------	142	35	55	1	1	1
West Virginia [4]	3	1	4	1	5	5	55	7	7	1	3	2
North Carolina [3]	7	8	14	------	------	------	18	21	27	0	0	0
South Carolina [1]	1	4	4	92	87	66	76	2	2	2	1	1
Georgia [1 3]	4	8	10	11	21	------	36	4	------	0	0	0
Florida [1]	6	1	8	16	1	1	17	1	1	0	0	0
E. SO. CEN.												
Kentucky	3	1	5	------	------	2	45	40	27	1	0	3
Tennessee [3]	1	1	4	16	13	7	48	17	16	0	0	1
Alabama [1]	5	4	12	3	3	3	32	51	18	3	6	4
Mississippi [1 4]	3	2	9	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	0	1	3	5	23	7	27	1	2	0	0	0
Louisiana [1]	2	4	7	------	2	6	0	3	3	1	0	0
Oklahoma	2	2	3	7	8	7	20	8	8	0	0	0
Texas [1]	22	19	17	348	183	51	103	90	37	0	1	1
MOUNTAIN												
Montana	0	0	0	------	------	------	3	11	11	0	0	0
Idaho	0	0	1	------	------	2	2	4	4	0	0	0
Wyoming [3]	2	0	0	5	------	------	2	5	5	1	0	0
Colorado [3]	13	10	6	14	2	------	30	10	14	0	0	0
New Mexico	0	0	3	1	------	------	31	16	16	0	0	0
Arizona	3	0	0	23	23	15	69	36	20	0	0	0
Utah [4]	0	0	0	1	------	------	6	31	22	0	0	0
Nevada	0	------	------	------	------	------	2	------	------	0	------	------
PACIFIC												
Washington[3]	1	3	1	1	------	------	5	11	16	0	0	0
Oregon[3]	1	1	0	1	1	8	18	33	15	0	1	0
California [1 3]	4	19	19	[6] 179	11	10	333	88	155	2	4	4
Total	141	179	278	805	436	266	3,352	2,999	2,170	27	34	34
30 weeks	7,123	8,371	12,811	597,895	167,969	150,757	825,027	223,679	267,442	1,328	1,094	2,039

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940	
NEW ENG.												
Maine	0	0	0	4	2	4	0	0	0	2	6	2
New Hampshire	0	0	0	2	1	1	0	0	0	1	0	0
Vermont	0	0	0	0	0	2	0	0	0	3	0	0
Massachusetts	2	0	2	49	30	32	0	0	0	1	1	3
Rhode Island	0	0	0	3	0	2	0	0	0	0	0	1
Connecticut	2	0	1	7	6	9	0	0	0	1	1	3
MID. ATL.												
New York [1]	11	6	6	70	92	92	0	0	0	12	4	12
New Jersey [3]	2	3	3	25	50	23	0	0	0	3	5	5
Pennsylvania	8	0	3	38	76	72	0	0	0	10	8	10
E. NO. CEN.												
Ohio	11	7	5	49	38	55	1	0	1	4	6	7
Indiana	8	13	2	15	17	21	0	0	6	2	6	6
Illinois	4	4	7	55	87	80	0	0	4	15	7	18
Michigan [4]	7	7	7	53	50	76	0	0	1	2	7	5
Wisconsin	0	1	0	33	36	54	0	0	1	0	0	1
W. NO. CEN.												
Minnesota	5	0	0	12	12	25	0	6	6	0	2	0
Iowa	3	2	1	14	5	18	0	3	7	2	1	4
Missouri [3]	0	0	1	55	18	13	0	0	4	5	30	15
North Dakota [5]	0	0	0	1	1	3	0	1	1	0	0	1
South Dakota [3]	0	1	0	1	1	6	0	1	1	0	0	0
Nebraska	2	0	0	6	1	3	0	0	0	1	0	0
Kansas	0	8	3	20	15	23	1	0	0	2	5	5
SO. ATL.												
Delaware	0	0	0	4	2	2	0	0	0	0	0	0
Maryland [3] [4]	3	0	0	9	5	10	0	0	0	0	1	5
Dist. of Col. [3]	1	0	0	3	4	4	0	0	0	0	0	2
Virginia [1] [3]	3	3	3	10	13	11	0	0	0	8	7	23
West Virginia [4]	1	6	1	8	7	11	1	0	0	10	11	11
North Carolina [3]	5	1	2	3	5	15	0	0	0	7	6	21
South Carolina [1]	5	0	1	3	6	2	1	0	0	12	11	15
Georgia [1] [3]	79	1	2	3	7	7	0	0	0	13	38	38
Florida [1]	16	1	1	3	0	1	0	0	0	13	1	1
E. SO. CEN.												
Kentucky	11	0	2	20	5	9	0	0	0	8	21	37
Tennessee [3]	24	0	2	17	12	12	0	2	0	21	9	28
Alabama [1]	58	2	2	10	11	10	0	1	0	9	9	18
Mississippi [1] [4]	10	1	1	1	6	4	0	0	0	7	11	15
W. SO. CEN.												
Arkansas	2	0	1	1	1	4	0	0	0	14	36	36
Louisiana [1]	2	8	3	7	4	4	0	0	0	14	38	37
Oklahoma	1	6	3	6	13	7	0	0	0	9	20	32
Texas [1]	3	10	10	14	15	16	0	0	0	38	43	67
MOUNTAIN												
Montana	1	1	0	10	4	10	0	0	2	0	0	2
Idaho	0	3	0	4	2	2	0	0	2	0	1	1
Wyoming [3]	1	1	0	1	3	3	0	0	0	0	1	0
Colorado [3]	0	0	0	4	12	11	1	3	1	5	2	4
New Mexico	1	1	0	0	2	3	0	0	0	3	7	6
Arizona	0	0	0	1	2	2	1	0	0	1	4	3
Utah [4]	1	2	0	1	4	5	0	0	0	9	1	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington [3]	0	18	0	8	15	14	0	0	2	1	4	3
Oregon [3]	0	4	1	4	3	6	0	4	4	1	6	5
California [1] [3]	9	18	18	35	45	56	0	0	9	8	8	13
Total	302	139	139	702	746	884	6	21	76	277	385	534
30 weeks	1,525	1,206	1,206	90,109	116,998	134,728	1,167	1,893	7,795	3,512	3,829	5,599

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended— July 26, 1941	Whooping cough, Week ended— July 27, 1940
NEW ENG.		
Maine	30	25
New Hampshire	7	0
Vermont	1	16
Massachusetts	131	126
Rhode Island	44	5
Connecticut	57	63
MID. ATL.		
New York [1]	279	321
New Jersey [3]	115	114
Pennsylvania	322	322
E. NO. CEN.		
Ohio	326	306
Indiana	27	16
Illinois	146	135
Michigan [4]	234	310
Wisconsin	186	106
W. NO. CEN.		
Minnesota	40	46
Iowa	25	31
Missouri [3]	22	51
North Dakota [5]	17	7
South Dakota [3]	11	5
Nebraska	19	16
Kansas	117	71
SO. ATL.		
Delaware	1	7
Maryland [3 4]	76	143
Dist. of Col.[3]	12	17
Virginia [1 3]	46	55
West Virginia [4]	29	63
North Carolina [3]	184	103
SO. ATL.—continued		
South Carolina [1]	100	19
Georgia [1 3]	44	11
Florida [1]	28	0
E. SO. CEN.		
Kentucky	72	78
Tennessee [3]	76	65
Alabama [1]	26	23
Mississippi [1 4]	----------	----------
W. SO. CEN.		
Arkansas	4	23
Louisiana [1]	4	14
Oklahoma	18	17
Texas [1]	190	244
MOUNTAIN		
Montana	6	0
Idaho	10	11
Wyoming [3]	14	10
Colorado [3]	113	17
New Mexico	19	26
Arizona	25	7
Utah [4]	82	78
Nevada	1	----------
PACIFIC		
Washington [3]	84	36
Oregon [3]	34	15
California [1 3]	435	297
Total	3,889	3,471
30 weeks	135,672	96,902

[1] Typhus fever week ended July 26, 1941, 73 cases as follows: New York, 5; Virginia, 1; South Carolina, 2 Georgia, 23; Florida, 6; Alabama, 8; Mississippi, 1; Louisiana, 7; Texas, 18; California, 2.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended July 26, 1941, 19 cases as follows: New Jersey, 1; Missouri, 1; South Dakota, 1; Maryland, 1; District of Columbia, 1; Virginia, 2; North Carolina, 1; Georgia, 1; Tennessee, 2; Wyoming, 4; Colorado, 1; Washington, 1; Oregon, 1; California, 1.
[4] Period ended earlier than Saturday.
[5] Encephalitis, week ended July 26, 1941: North Dakota, 65.
[6] Delayed report of 152 cases included.

PLAGUE INFECTION IN GROUND SQUIRRELS AND FLEAS IN KERN COUNTY, CALIF.

Under date of July 18, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved in ground squirrels and fleas from ground squirrels, all *C. beecheyi*, in Kern County, Calif., as follows:

In 2 ground squirrels, 1 submitted to the laboratory on June 24 and the other taken on June 28, both from a ranch at Keene; in 2 pools of fleas submitted to the laboratory on June 24 from the same ranch, 1 a pool of 1,139 fleas from 68 ground squirrels, and the other of 200 fleas from 7 ground squirrels; in a pool of 239 fleas from 31 ground squirrels submitted to the laboratory on June 20 from a location 5 miles west and 1 mile south of Democrat Springs.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 12, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	83	25	11	1,298	284	415	6	349	47	1,335	--------
Current week [1]	42	36	11	1,416	219	323	0	338	33	1,356	--------
Maine:											
Portland	0	------	0	0	2	0	0	0	0	0	24
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	5
Nashua	0	------	0	0	0	0	0	0	0	1	5
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	1	0	0	0	0	0	0	9
Rutland	0	------	0	0	1	0	0	0	0	0	6
Massachusetts:											
Boston	0	------	1	79	1	19	0	8	0	22	186
Fall River	0	------	0	1	0	2	0	1	0	5	25
Springfield	0	2	0	24	0	5	0	0	1	5	25
Worcester	0	------	0	3	1	3	0	4	0	1	30
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	19
Providence	1	------	0	9	0	0	0	0	1	12	59
Connecticut:											
Bridgeport	0	------	0	26	0	0	0	2	0	1	21
Hartford	0	------	0	7	0	1	0	2	0	2	41
New Haven	0	------	0	1	1	0	0	0	0	1	29
New York:											
Buffalo	0	------	0	14	6	4	0	2	0	12	126
New York	13	3	0	122	51	49	0	71	3	118	1,205
Rochester	0	------	0	34	1	0	0	0	0	13	60
Syracuse	0	------	0	18	4	2	0	1	0	18	40
New Jersey:											
Camden	0	------	0	2	1	0	0	1	0	7	33
Newark	1	------	0	22	1	2	0	3	0	15	90
Trenton	0	------	0	11	2	1	0	2	0	0	47
Pennsylvania:											
Philadelphia	2	------	0	36	17	22	0	22	2	34	434
Pittsburgh	0	------	0	134	5	6	0	7	2	66	147
Reading	0	------	0	7	0	0	0	0	0	0	27
Scranton	0	------	------	17	------	0	0	------	0	0	------
Ohio:											
Cincinnati	4	------	0	0	0	2	0	8	0	5	171
Cleveland	0	1	0	8	6	13	0	9	0	88	188
Columbus	0	1	1	17	2	5	0	5	0	31	124
Toledo	0	3	0	134	0	1	0	5	0	31	77
Indiana:											
Anderson	0	------	0	1	0	0	0	1	0	0	10
Fort Wayne	0	------	0	0	1	0	0	0	2	1	27
Indianapolis	0	------	0	7	5	1	0	5	0	4	124
South Bend	------	------	------	------	------	------	------	------	------	------	------
Terre Haute	0	------	0	1	0	1	0	0	0	0	13
Illinois:											
Alton	0	------	0	6	0	0	0	0	0	1	9
Chicago	7	3	2	29	15	39	0	35	1	60	601
Elgin	0	------	0	3	1	0	0	1	0	6	8
Moline	0	------	0	3	0	0	0	0	0	4	------
Springfield	0	------	0	11	1	2	0	0	0	0	20
Michigan:											
Detroit	2	------	1	78	9	33	0	10	0	79	271
Flint	0	------	0	7	2	2	0	0	0	2	26
Grand Rapids	0	------	0	21	0	3	0	0	0	6	34
Wisconsin:											
Kenosha	0	------	0	3	0	0	0	0	0	0	7
Madison	0	------	0	13	0	0	0	0	0	4	23
Milwaukee	0	------	0	203	2	12	0	5	0	78	103
Racine	0	------	0	21	0	2	0	1	0	13	8
Superior	0	------	0	1	0	0	0	0	0	6	11

[1] Figures for Barre and South Bend estimated; reports not received.

City reports for week ended July 12, 1941

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	0	0	0	0	1	0	27	20
Minneapolis	0		0	5	2	2	0	0	0	21	74
St. Paul	0		0	1	1	3	0	0	0	14	64
Iowa:											
Cedar Rapids	0			0		0	0		0	1	
Davenport	0			0		0	0		0	0	
Des Moines	0			6		2	0		0	6	26
Waterloo	0			3		0	0		0	1	
Missouri:											
Kansas City	0		0	18	4	6	0	2	0	12	81
St. Joseph	0		0	0	1	1	0	0	0	0	26
St. Louis	1		0	37	7	4	0	6	2	46	222
North Dakota:											
Fargo	0		0	0	0	0	0	0	0	3	8
Grand Forks	0			0		0	0		0	0	
Minot	0			3		0	0		0	1	4
South Dakota:											
Aberdeen	0			1		1	0		0	0	
Sioux Falls	0			0		0	0		0	0	10
Nebraska:											
Lincoln	0			2		1	0		0	2	
Omaha	0		3	5	0	5	0	1	0	0	68
Kansas:											
Lawrence	0		0	1	0	0	0	0	0	1	11
Topeka	0		0	4	1	0	0	0	0	25	7
Wichita	0		0	3	5	3	0	0	0	10	35
Delaware:											
Wilmington	0		0	1	2	3	0	0	0	0	29
Maryland:											
Baltimore	0		0	186	5	8	0	14	1	58	194
Cumberland	0		0	2	0	0	0	0	0	0	16
Frederick	0		0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	0		0	37	6	3	0	6	0	1	146
Virginia:											
Lynchburg	0		0	32	0	0	0	0	0	5	10
Norfolk	0		0	1	0	0	0	0	0	1	20
Richmond	0		0	7	1	2	0	1	1	0	32
Roanoke	0		0	3	0	0	0	1	0	0	16
West Virginia:											
Charleston	0		0	0	1	0	0	0	0	0	7
Huntington	0			0		0	0		1	0	
Wheeling	0		0	13	0	0	0	1	0	6	18
North Carolina:											
Gastonia	0			0		0	0		0	0	
Raleigh	0		0	3	1	0	0	1	0	12	12
Wilmington	1		0	5	0	0	0	0	0	35	10
Winston-Salem	0		0	9	0	0	0	1	0	2	16
South Carolina:											
Charleston	0	1	0	0	1	0	0	0	2	1	18
Florence	0	1	0	2	3	0	0	0	0	5	19
Greenville	0		0	0	1	0	0	1	0	0	11
Georgia:											
Atlanta	0	2	0	3	2	3	0	5	1	1	95
Brunswick	0		0	0	0	0	0	0	0	0	1
Savannah	0		0	5	2	0	0	1	0	0	28
Florida:											
Miami	0	2	0	1	0	0	0	3	1	2	26
St. Petersburg	0		0	1	0	0	0	1	0	0	14
Tampa	0		0	0	1	0	0	1	0	1	31
Kentucky:											
Ashland	0		0	1	0	0	0	0	0	3	8
Covington	0		0	0	0	0	0	1	0	0	15
Lexington	0		0	0	0	0	0	0	0	6	13
Louisville	0		0	52	7	16	0	2	0	30	85
Tennessee:											
Knoxville	0		0	1	0	0	0	1	1	1	32
Memphis	0	8	0	5	0	1	0	4	3	2	88
Nashville	0		0	0	1	4	0	4	2	18	69
Alabama:											
Birmingham	0	1	0	3	1	0	0	6	2	8	72
Mobile	0		0	2	1	0	0	2	0	0	35
Montgomery	1			0		0	0		0	0	
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0		0	3	2	0	0	0	0	2	30

City reports for week ended July 12, 1941

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	5
New Orleans	1	1	0	0	0	5	0	11	5	25	125
Shreveport	1	------	0	0	2	1	0	7	0	0	50
Oklahoma:											
Oklahoma City	0	------	0	2	3	0	0	0	1	1	72
Tulsa	0	------	0	3	3	0	0	0	0	1	28
Texas:											
Dallas	1	------	0	11	0	0	0	2	0	0	66
Galveston	0	------	0	0	2	0	0	0	0	0	18
Houston	0	------	1	1	5	1	0	7	1	1	83
San Antonio	0	1	0	0	9	1	0	5	0	13	95
Montana:											
Billings	0	------	0	0	0	1	0	0	0	0	8
Great Falls	0	------	0	0	1	1	0	0	0	12	13
Helena	0	------	0	0	0	1	0	0	0	1	7
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	1	0	0	0	0	0	0	11
Colorado:											
Colorado Spgs	0	------	0	0	0	0	0	0	0	0	9
Denver	4	6	0	16	3	3	0	3	0	143	84
Pueblo	0	------	0	5	1	0	0	0	0	8	14
New Mexico:											
Albuquerque	9	------	0	0	0	0	0	1	0	0	7
Arizona:											
Phoenix	0	14	--------	4	-------	0	0	-------	0	9	--------
Utah:											
Salt Lake City	0	------	0	3	0	4	0	0	0	23	38
Washington:											
Seattle	0	------	0	0	1	0	0	2	0	16	64
Spokane	0	------	0	2	0	0	0	0	0	3	31
Tacoma	0	------	0	0	0	1	0	0	0	22	39
Oregon:											
Portland	1	------	0	1	4	0	0	0	0	4	61
Salem	0	------	--------	1	-------	0	0	-------	0	0	--------
California:											
Los Angeles	0	6	1	18	5	18	0	25	0	22	371
Sacramento	1	------	0	1	0	3	0	4	0	21	35
San Francisco	2	------	1	6	6	4	0	10	0	31	180

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Maryland:			
New York	5	1	2	Baltimore	0	0	1
Pennsylvania:				Georgia:			
Philadelphia	1	1	1	Atlanta	0	0	11
Pittsburgh	1	0	0	Brunswick	0	0	1
Ohio:				Savannah	0	0	1
Cleveland	0	0	3	Florida:			
Illinois:				Miami	0	0	1
Chicago	0	0	1	Alabama:			
Minnesota:				Birmingham	0	0	6
Duluth	0	0	1	Louisiana:			
Missouri:				New Orleans	0	0	1
St. Louis	0	0	1	Oregon:			
North Dakota:				Portland	0	0	1
Fargo	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Pittsburgh, 2; Fargo, 19; Minot, 1. Deaths: New York, 1; Fargo, 1; Topeka, 1; Washington, D. C., 1; Oklahoma City, 1.

Pellagra.—Cases: Atlanta, 2; Savannah, 2; Montgomery, 1; San Antonio, 1.

Typhus fever.—Cases: New York, 1; Atlanta, 1; Mobile, 1; Shreveport, 4.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 21, 1941.—During the week ended June 21, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		4	2	4	7			1	2	20
Chickenpox		45		107	360	88	65	63	42	770
Diphtheria	2	22		22	5	6		1		58
Influenza		5			5					10
Measles		18		413	801	60	13	24	175	1,504
Mumps				112	142	30	25	6	5	320
Pneumonia		9			8				7	24
Poliomyelitis					2		1			3
Scarlet fever	4	13	1	109	145	9	3	17	13	314
Smallpox							1			1
Tuberculosis	3	24	12	71	39	34	10	1		194
Typhoid and paratyphoid fever			1	11	5			1		18
Whooping cough		4	1	55	104	2		9	54	289

Poliomyelitis epidemic in Manitoba.—Information received under date of July 25, 1941, reports an outbreak of poliomyelitis in the Province of Manitoba, Canada. A total of 101 cases, with 2 deaths, had been reported to the Provincial Bureau of Health since July 1. About 75 percent of the cases originated in Greater Winnipeg, while the remainder occurred in smaller municipalities in the immediate vicinity of the city.

The disease was reported to be of mild type. About 25 percent of the persons affected developed muscular weakness or paralysis. The cases were equally distributed between males and females, and the majority were in children 8 to 15 years of age.

CUBA

Provinces—Notifiable diseases—4 weeks ended June 21, 1941.—During the 4 weeks ended June 21, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		1	2	10		17	30
Chickenpox		6	3	2		10	21
Diphtheria		16	1	1		8	26
Dysentery		1					1
Leprosy		2		1		2	5
Malaria	19	8		16		73	116
Measles			6	22	6		34
Scarlet fever		4					4
Tuberculosis	27	62	16	53	5	50	213
Typhoid fever	19	55	22	41	6	42	185
Whooping cough		2				2	4
Yaws						3	3

[1] Includes the city of Habana.

PORTUGAL

Notifiable diseases—Year 1940.—The following table shows the numbers of cases of certain notifiable diseases with deaths from the same causes in Portugal during the year 1940:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	181	94	Scarlet fever	509	17
Diphtheria	2,573	242	Smallpox	771	45
Lethargic encephalitis	14	4	Typhoid fever	5,594	532
Poliomyelitis	146	13	Typhus fever	1	1

NOTE.—Population, 1937: 6,877,000.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of July 25, 1941, pages 1531-1534. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Argentina.—Plague has been reported in Argentina as follows: February 1941, Cordoba Province, 1 case; March 1941, Santa Fe Province, 13 plague-infected rats; April 1941, Cordoba Province, 2 cases, 1 death; Santa Fe Province, 42 plague-infected rats; May 1941, Cordoba Province, 12 cases, 8 deaths, including 2 fatal cases of pneumonic plague; Santa Fe Province, 12 plague-infected rats; June 1941, Cordoba Province, 5 cases, 3 deaths, including 1 fatal case of pneumonic plague.

Canada.—Under date of July 14, 1941, Dr. R. E. Wodehouse, Deputy Minister of the Department of Pensions and National Health of Canada, reported plague infection proved bacteriologically on June 24 in a ground squirrel taken southeast of Stanmore, Alberta, about 180 miles north of the international boundary.

Typhus Fever

Bolivia.—Typhus fever has been reported in Bolivia as follows: January 1941, La Paz Department, 5 cases; Potosi Department, 2 cases; February 1941, La Paz Department, 2 cases; Oruro Department, 1 case; March 1941, Cochabamba Department, 3 cases; La Paz Department, 50 cases; Oruro Department, 4 cases; Potosi Department, 8 cases.

Yellow Fever

French Equatorial Africa—Gabon—Mayumba.—On June 18, 1941, 4 cases of yellow fever with 3 deaths were reported at Mayumba, Gabon, French Equatorial Africa.

Ivory Coast—Bingerville.—On July 12, 1941, 1 death from suspected yellow fever was reported in Bingerville, Ivory Coast.

X

Public Health Reports

VOLUME 56 — AUGUST 8, 1941 — NUMBER 32

IN THIS ISSUE

Skin Hazards Found in Airplane Manufacturing Plants

Protection Test for Identification of Weil's Disease

Toxicity of the Molecular Components of Lead Arsenate

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • AUGUST 8, 1941 • No. 32

SKIN HAZARDS IN AIRPLANE MANUFACTURE

By Louis Schwartz, *Medical Director, United States Public Health Service,* and John P. Russell, *Chief, Industrial Hygiene Service, California State Department of Public Health*

This report is based on studies made in nine airplane factories located in various parts of the United States, employing over 100,000 workers, and making various types of aircraft—training planes, commercial planes, and all types of fighting planes and bombers. Four of these plants had reported 117 cases of dermatitis to the Compensation Commission during the preceding 15 months. Records were not available from the other five plants. Thirty-six active cases of dermatitis were seen during the course of our inspection, 24 of which were definitely of occupational origin.

The three principal parts of an airplane, (1) the motor, (2) fuselage, wings, and controls, and (3) the flying instruments, are made in different factories but are all assembled into the complete machine at the factory where the fuselage, wings, and controls are built, and where our studies were made.

PROCESS

The airplane consists essentially of a chassis or framework of stainless steel metal tubing, the parts welded together somewhat as the framework of a bicycle. Around this framework is built the fuselage, and to the fuselage are attached the wings, the controls, and the motor.

The fuselage is made of sheets of duraluminum alloy called "dural". The sheets of metal are molded into proper shape by presses or by hand and the parts are riveted or welded together. In most of the larger planes the wings, tail, and controls are also made of aluminum alloy, the composition of which may vary somewhat according to the part of the plane into which it goes. In most small planes, and some larger ones, the wings and controls consist of a framework of metal over which is drawn a fabric covering made impervious by the application of "dope." "Dope" consists essentially of cellulose acetate, or nitrate, dissolved in a solvent such as acetone, amyl acetate, etc.

Other alloys of aluminum, such as Alclad and Dow Metal, are used in various parts of the plane.

The rivets, screws, nuts, and bolts which are used where welding cannot be done, are made of iron or steel, made rustproof by cadmium plating or by anodizing.

The various parts of the plane, when completed, are assembled on the assembling line in a manner similar to that of an automobile, but the line moves very much more slowly.

Dural, an alloy consisting of aluminum, copper, magnesium, manganese, and iron, Alclad, containing the same materials but in different proportions, and Dow Metal, an alloy of magnesium, manganese, silica, and aluminum, come into the factory in large sheets, several sheets being crated together in wooden crates for shipment. Some of the sheets are heavily coated with an oil called "fish oil", the composition of which is said to consist of 96 percent highly refined Mid-Continent Neutral Oils to which is added a 4 percent winter pressed fish oil.[1] In one large factory, many workers exposed to this oil developed a hypersensitivity to it as shown by patch tests, and dermatitis of the forearms, face, and other exposed parts ensued.[2] None of the workers uncrating the metal from the wooden crates were affected, perhaps because they all wore gloves and coveralls, primarily as protection against cuts while lifting the thin, sharp-edged sheets, but which evidently also served to prevent contact of the skin with the oil. Workers who handled cut sheets before the oil was washed off did not wear such protective clothing and they were more or less constantly in contact with the oil. It was in this group of workers that dermatitis caused by "fish oil" was observed (fig. 1).

We have had reports of dermatitis occurring among workers in a motor manufacturing plant exposed to an oil sprayed on metal parts to prevent corrosion. This oil also has a fishy odor, and was thought to be "fish oil," but inquiry from the manufacturer revealed that it consisted of fatty oils derived from rapeseed, lard, and rice bran, plus butyl alcohol, and about 3 percent of a tertiary phenolic amine, a condensation product of dimethylamine with phenol in the presence of formaldehyde. This tertiary phenolic amine is said to neutralize free acid, thus preventing rancidity of the fatty oils and also preventing corroding of the metal. The tertiary amine has the fishy odor characteristic of the methylamines, and this may lead one to think that there is fish oil in the compound. The tertiary phenolic amine is also an irritant and sensitizer if allowed to remain on the skin for a considerable length of time. This, or another inhibitor or noncorro-

[1] An oil of animal or vegetable origin is added to the petroleum oil in order to make it adhere to the metal.

[2] Lounsberry, C. Ray: Occupational dermatoses in the aircraft industry. California and West. Med., 51:309–313 (1939).

sive with similar action that may be in the winter pressed fish oil, is more likely to be the actual cause of the dermatitis occurring among the workers exposed to the so-called fish oil on the dural sheets than any animal, vegetable, or fish oil which it may actually contain, as such oils are usually harmless.[3]

In some factories, the dural sheets when received were covered with a coat of varnish which was applied to them by the makers in order to protect them from scratches and cuts in shipping and handling. Some workers were found who had dermatitis caused by sensitivity to this varnish. Sheets of uncoated dural were also received in these factories and in some places the sheets, after being uncrated, were dipped into a tank containing a preparation called "line oil" in order to protect the surface from scratches in the process of manufacture. "Line oil" consists of soybean oil and spent varnish containing various resins dissolved in Stoddart solvent (a petroleum distillate). The sheets, after being dipped into the tank of "line oil", are lifted out, allowed to drip and dry, leaving a dry surface coating consisting of the oil and resin. The workers at this job had their arms, hands, and clothes soiled with the "line oil" and a number of cases of dermatitis have resulted. This dermatitis may be due to the defatting of the skin by the Stoddard solvent or it may be caused by the development of allergy to the resins or the soybean oil. There were no cases of dermatitis found in any of the factories that could be attributed to the uncoated aluminum or magnesium alloys. Therefore, it is believed that the so-called "dural poisoning" in airplane factories is not caused by the alloy itself, but by the oils, varnishes, and paints which are applied to its surface.

Dermatitis among this group of workers can be prevented by having all sheets of oiled or varnished alloy which come into the factory washed clean of coating before permitting them to be handled by the workers. The men employed at cleaning the coating from the sheets should wear protective clothing such as rubber boots and gloves, aprons, and sleeves made of impervious material such as the synthetic resins, pliofilm, koroseal, vinylite, etc. Men exposed to "line oil" should be similarly protected.

Since there is no particular starting point in airplane manufacture, the various processes in which skin hazards occur will be described in alphabetical order.

ANODIZING DEPARTMENT

Anodizing imparts to the metal a dull gray finish which is rustproof and tarnishproof. Before anodizing, all dirt, grease, and scale must be removed from the surface of the metal. This is done by immersing

[3] The makers deny the presence of an inhibitor in this oil.

in acids and solvents and washing in a hot alkali solution, then in water, then again in a solution of soap (Kelite), again rinsing in water, and then immersing in the anodizing tank. The anodizing tank contains a solution of chromic acid and dichromates. Although most of the dipping of the metal parts into the various solutions is done by mechanical means and the anodizing tank is vented and usually kept closed when not in use, splashes from the tanks containing the cleaning solutions and fumes of chromic acid and dichromates from the anodizing tank may affect the worker, causing dermatitis on the intact skin, and ulcers if the irritant liquid enters abrasions.

In some factories this department also contains tanks of nitric acid and hydrofluoric acid into which the metal is dipped. Dermatitis may occur from splashes and fumes of both these powerful acids.

Various coal tar and petroleum distillates as well as trichlorethylene are used in this department for degreasing metals and for removing paint from them before they are anodized. Dermatitis has occurred from exposure to these degreasers which are fat solvents and sensitizers. When the wet metal is lifted out of the anodizing tank and hung up to dry, workers handling it may develop ulcers and dermatitis from the chromic acid solution remaining on the metal as well as from the fine gray dust which coats the parts after they are dry. In addition to proper local exhaust ventilation over these tanks,[4 5 6] the workers in this department should be furnished with long rubber gauntlets over which they should wear sleeves of impervious material buttoned at the wrist. Aprons of a similar material would prevent the soiling of the clothes and dermatitis of the covered parts. Workers exposed to the fumes issuing from chromic acid and hydrofluoric acid tanks should insert vaseline into the nostrils several times a day in order to protect the nasal mucosa from the corrosive effect of these chemicals.

Because the various solvents used in this department act to defat the skin and thus cause drying, chapping, and chronic eczema, it is recommended that no strong soaps, bleaches, or solvents be used by the workers for cleaning the skin after work. A neutral sulfonated castor oil containing 2 percent of a wetting agent (such as Duponol, Aerosol, Santomerse, Naconol, or Igepon) should be provided for the workers, instead of soap, for cleansing the hands after work. Such a mixture, because of its vegetable oil content, will not defat the skin and yet will clean it. Workers with dry, chapped skins should also rub into the skin before and after work a mixture of an-

---

[4] Bloomfield, J. J., and Blum, W.: Health hazards in chromium plating. Pub. Health Rep., 43: 2330 (1928). Reprint No. 1245.

[5] Riley, E. C., and Goldman, F. H.: Control of chromic acid mists from plating tanks. Pub. Health Rep., 52: 172 (1937). Reprint No. 1801.

[6] Bloomfield, J. J.: Poisoning by chromium compounds. Safety Eng., 61: 222 (1931).

hydrous lanolin and olive oil. This will act to buffer the action of the fat solvents on the skin and will tend to replace whatever fats such solvents may remove from the skin.

DEGREASING

Degreasing tanks are usually located in the anodizing and cadmium plating departments. Some of them are large rectangular tanks with the surface of the solvent, usually trichlorethylene, about three feet below the top of the tank. A few inches above the level of the liquid, and running around the inside of the tank, there are cooling coils for the purpose of preventing the evaporation and escape of fumes. Some degreasing tanks are simple covered containers with no other safety appliances. Workers dipping metal parts into the tanks are exposed to the fumes and vapors which may escape, and to splashes when the metal parts enter the liquid, and drippings of the solvent as the metals are taken out. Trichlorethylene is a fat solvent and can cause a chronic dry, cracked, fissured eczema of the hands and arms. It is also a sensitizer and can cause a more or less generalized acute eczematoid type of dermatitis which begins as an erythema, becomes papular, then vesicular, and is followed by oozing, crusting, and desquamation.

All degreasing tanks should be so constructed that fumes cannot escape.[7] The workers should be protected against splashes and dripping by protective clothing. Rubber and the ordinary impervious films are attacked by trichlorethylene and carbon tetrachloride, the chemicals usually used for degreasing, but the polyvinyl alcohols are not. Aprons, sleeves, and gloves made of the polyvinyl alcohols can be obtained and should be used by workers on degreasing operations where the chlorinated hydrocarbons are used as degreasing solutions.[8]

To counteract the defatting action on the skin of these solvents, a skin cleanser and protective ointment should be used similar to that described under anodizing.

"DOPE" ROOM

Here the fabric parts of the plane (wings and controls) are fitted over the metal framework and made impervious by the application of the so-called "dopes". The "dopes" are applied by hand brushes. They consist essentially of a solution of cellulose nitrate or acetate in a volatile solvent such as acetone, amyl acetate, etc., which, after evaporating, leaves the fabric impregnated and coated with the cellulose compound, making it impervious. On entering this room, the

[7] Witheridge, W. N., and Walworth, H. T.: Ventilation of a trichlorethylene degreaser. J. Ind. Hyg. and Toxicol., 22: 175–187 (May 1940).

[8] "Resistoflex" is the trade name of a polyvinyl alcohol which will resist the action of the chlorinated hydrocarbons, but it will not resist the action of water and steam

strong odor of solvents first irritates the nose, throat, and eyes, causing coughing and lacrimation, but after a few minutes these symptoms cease, probably because of the anesthetic action of these esters on the mucous membranes. Most of the "dope" rooms have exhaust ventilation of some kind, but in spite of this the "dope" permeates the air.

The "dopes" have a defatting action on the skin and can cause dry, chapped hands, and chronic, fissured eczemas of the hands and arms. A small percentage of workers become sensitized and develop acute eczematoid types of dermatitis of the hands, arms, face, and whatever other parts may be exposed to the solvents or their fumes (fig. 2).

Workers exposed to "dopes" should wear fabric-lined rubber gloves over which sleeves made of impervious fabrics should fasten at the wrist. Long aprons of the same materials will protect the clothes from being soiled. Workers who are hypersensitive should apply to the face, neck, and other exposed parts the protective ointment of lanolin and olive oil described above. Those workers with dry and defatted skin should use the mixture of sulfonated castor oil and wetting agent described above for a hand cleanser instead of the usual soaps or volatile solvents.

It was observed that some of the girls employed at sewing the fabric coverings of the wings and controls of airplanes developed blisters and irritation of the fingers from the long, sharp needles which they used. Many of them wore leather finger shields for protection. Such shields should be furnished to all engaged in this occupation.

DROP HAMMER DEPARTMENT

Many of the metal sheets are shaped to the desired form by placing them on molds and allowing hammers, the faces of which fit into the molds, to fall on them. The hammers are raised by hand ropes, and dermatitis of the hands has occurred from the mechanical action of friction in handling the ropes as well as from the oil and resin with which some of the ropes are treated in order to make them strong and serviceable. Petroleum oils and grease are used on the dies and metal plates in order to protect the metal, and the clothes often become soiled with oil and grease, resulting in folliculitis of the thighs and forearms, especially among workers who do not frequently change to clean clothes or who neglect cleaning their skin after work. To prevent these conditions, workers at the drop hammers should wear leather or canvas gloves and impervious sleeves and aprons.

The same hazards are present in the hydraulic press department where larger pieces of metal are molded in similar manner by hydraulic presses.

FIGURE 1.—Allergic dermatitis from "fish oil."

FIGURE 2.—Dermatitis caused by volatile solvents used in dopes.

FIGURE 3.—Oil acne caused by cutting oils.

GAS TANKS

Gas tanks are made of molded dural plates welded together. The complete tanks are dipped in a vat containing a solution of potassium dichromate and nitric acid resulting in a grayish-green color on the surface of the tank which prevents rusting. The vat containing the potassium dichromate and nitric acid is an open one and workers should be protected against splashes and fumes by rubber gloves, impervious sleeves, and aprons, and by placing vaseline in the nostrils as described under anodizing.

A sealing compound is applied to the surface of the gas tank. This compound consists of zinc chromate, asbestos, mica, a synthetic resin, and a drying oil in a thinner such as ethyl acetate. Dermatitis may result among workers applying this sealing compound to the gas tanks. The solvent may cause dermatitis either by its fat solvent action or by its sensitizing action, and skin sensitivity to zinc chromate and synthetic resins has also been observed among these workers. Workers engaged in applying this paint to the gas tanks should wear the protective clothing described above under the discussion of the hazards in the "dope" room.

Gas tanks are enclosed in a covering of a rubber-like compound which is said to plug up bullet holes. The composition of this substance was not learned, but it is soft and doughy, resembling unvulcanized synthetic rubber. No cases of dermatitis were noted from handling this substance. A leather casing encloses the gas tank and its covering.

HEAT TREATMENT

Heat treatment increases the strength of the metal parts. Some of the parts are dipped in a tank containing molten sodium nitrite to which a small percentage of sodium dichromate has been added. The tank is covered with a lid, but when the lid is lifted, fumes of nitrous and chrome compounds are given off and may irritate the nose of workers standing over the tank. Therefore, in addition to exhaust vents over the lid, workers around this tank should insert vaseline into the nostrils to prevent nasal mucitis. Gloves are indispensable because of handling hot metal, but impervious sleeves and aprons should also be worn because the fumes may irritate the skin, causing dermatitis and ulcers.

Some of the metal is treated by immersion in molten sodium cyanide. The vessels containing the molten sodium cyanide usually have over them exhaust vents to prevent the fumes of hydrocyanic acid from coming in contact with the workers. Nevertheless, vaseline in the nostrils insures the protection of the nasal septum from whatever cyanide fumes faulty vents may allow to escape. Gloves and imper

vious sleeves and aprons should be worn to protect the skin from the corrosive action of cyanide.

HYDROFLUORIC ACID

Tanks containing hydrofluoric acid are located in some of the departments. Into them are dipped metal parts for etching and also for coating with fluoride so that they can be "spot welded." Burns of the skin and ulceration of the nasal septum are hazards to workers dipping metal into these tanks.[9] Tanks of hydrofluoric acid should be kept covered and vented so that the workers are not exposed to fumes and splashes of this corrosive liquid. The workers should insert vaseline into the nostrils several times a day to prevent nasal mucitis, and should wear sleeves, aprons, and gloves of impervious material.

MACHINE SHOP

The metal parts are cut and drilled in the machine shop. The lathes and other machines are lubricated by oils both soluble and insoluble. The soluble oils consist chiefly of sulfonated mineral oils which are miscible with water, forming a milky emulsion, and are used mainly to cool the cutting tools, although they also facilitate the actual cutting operation. The chief function of the insoluble oils is to make cutting easier and to save the cutting edges of the lathes, drills, etc., but the insoluble oils also act as cooling agents. The insoluble oils are composed of mixtures of mineral oils to which are added animal and vegetable oils, as for instance, the so-called lard oil which consists of a mixture of mineral oil and lard oil. When animal and vegetable oils are contained in cutting oils, the manufacturers of the oils usually add a small amount of preservative in order to prevent the oil from becoming rancid. Such preservative must be antacid and noncorrosive. The oils circulate in the machines, being filtered in the course of circulation in order to screen out metal chips and dirt. In some factories the oil in the machines is changed once a week, the used oil being thrown away. In other factories the change is made at irregular intervals whenever the worker thinks it should be, and the used oil may be reclaimed or thrown away. In still other factories, the oil is rarely changed, additional antiseptic being added to it from time to time as it becomes rancid. In the latter case, oil has at times been found to contain as high as 10 percent of the phenolic compound usually used as an antiseptic.

When used oil is reclaimed, it is usually filtered and centrifuged in order to remove metal chips and dirt; it is then heat-sterilized and reused.

[9] The burns resulting from hydrofluoric acid are not felt until several hours after contact. The resulting ulcers are painful, and show but little healing tendencies. Curetting the base, followed by aseptic dressings, is required to heal them.

In most airplane factories, the workers are provided with as many clean wiping cloths as they may require. The factory has these cloths washed and the metal chips removed; they are then used again by the workers.

Dermatitis is of frequent occurrence in the machine shop. It may be caused by metal slivers cutting the skin and the subsequent development of infections resulting in boils. Since some workers spit into the oil reservoir of the machines, and since even *Bacillus coli* has been isolated from cutting oils, it cannot be said that cutting oils do not contain bacteria, but they do not contain more bacteria than is usually found on the skin. Infection is more likely to occur from bacteria present on the skin than from bacteria in the oil, because pure mineral oils are unsuitable culture mediums for bacteria, and those cutting oils that contain animal or vegetable oils also contain antiseptics.

Folliculitis on the extensor surfaces of the forearms and the thighs is a frequent form of dermatitis from cutting oils. It is usually caused by long contact of the skin with oil-soaked sleeves and trousers. The oil plugs up the follicles of the skin causing comedones and acne, and secondary infection may follow, causing either folliculitis or boils (fig. 3).

Occasionally a worker becomes allergic to something in the cutting oils and develops an eczematoid type of dermatitis. Antiseptics and preservatives in cutting oils are sensitizers and may be the actual causes of the eczematoid type of cutting oil dermatitis. Some workers exposed to cutting oils and greases develop small, flat, brown, slightly elevated papillomata on the dorsum of the hands and forearms.

Those cutting oils which are composed principally of mineral oil also have a defatting action on the skin, tending to make it dry and chapped.

To prevent dermatitis from cutting oils, the oils should be frequently changed and no additional antiseptics or preservatives should be added to them. If they are reclaimed they should be filtered, neutralized, and heat sterilized. The workers should have daily changes of clean working clothes and should wear sleeves, aprons, and coveralls of impervious material to prevent soiling of the clothes. Showers should be provided for cleaning up after work. The workers should be supplied with clean wiping cloths, free from metal chips. Those who have chapped, dry skins should rub into the hands before and after work an ointment consisting of lanolin and olive oil. This ointment acts to fill the pores and prevent the entrance of the irritating cutting oil. If a wetting agent is incorporated in the lanolin-olive oil mixture, it will aid in emulsifying it and removing it from the skin after work. The use of strong soaps, solvents, and bleaches for skin cleansing pur-

poses should be prohibited. The sulfonated castor oil-wetting agent mixture described above is recommended as a substitute.

The tooling department, in which jigs and dies are made, also uses cutting oils and the workers are subject to the same hazards as in the machine shop. In addition to this, the workers in the jig department also come in contact with painted metal parts both dry and wet and dermatitis from zinc chromate paint was found among them.

The routers cut flat metal sheets into the desired shape by guiding electric cutting tools, fixed to a movable arm, along the edges of a pattern fastened on top of the sheets of the metal. The routers are sprayed with the cutting oil thrown from the cutting tool. Their clothes become saturated with this oil and cutting oil dermatitis has been found among them. Routers should also observe the precautions given above against cutting oil dermatitis.

MAGNETIC INSPECTION

Bolts and screws are inspected for cracks and other flaws by dipping them in kerosene containing filings of iron oxide. They are then placed in a machine called a magnescope. When the current is turned on, the particles of iron are deposited in whatever cracks there may be in the metal piece that is being tested, thus revealing the flaws. The parts that have been inspected and found to be flawless are then washed in Stoddart solvent and, after drying, are dropped in a dye solution consisting of methyl violet in wood alcohol which dyes them and shows that they have been inspected and found to be perfect.

Dermatitis may occur in the magnetic inspection department from the defatting action on the skin of the kerosene and the Stoddart solvent. Allergic dermatitis may also be caused by methyl violet [10] although no cases were found in this study. There is also a hazard of poisoning from the fumes of wood alcohol given off by the uncovered tank of dye solution. Workers engaged in magnetic inspection should wear impervious gloves, sleeves, and aprons. Ordinary rubber gloves are easily affected by the petroleum distillates. Therefore, it is recommended that the gloves be made of synthetic rubber, which is less easily affected, or of polyvinyl alcohol (Resistoflex) which is not affected at all by petroleum solvents. Sleeves and aprons of impervious material should also be worn.

PAINT SHOP

Painting is usually done by the spray method in booths, and the back wall of the booth has an air exhaust appliance to pull the fumes of the thinner and solvents away from the worker. In some of the paint shops there is a continuous sheet of water flowing along the

[10] Schwartz, Louis: Skin Hazards in American Industry. Part I, Pub. Health Bulletin No. 215, U. S. Government Printing Office, 1937. Page 23.

entire back wall, back of which the exhaust fan is located so that the fumes are pulled through the sheet of water which collects some of the ingredients of the paint. In some of the factories, these are recovered from the water. In spite of the exhaust ventilation, there is a strong odor of the thinners and solvents in the paint shop. Toluol, turpentine, and petroleum distillates are the principal thinners used in the paints. The pigment is usually zinc chromate. The paint also contains a drying oil and a resin. Dermatitis may result from the defatting and sensitizing actions of the thinner on the skin and from hypersensitivity to the resin and the zinc chromate. The workers in the paint department should wear gloves, sleeves, and aprons made of an impervious material, such as described under magnetic inspection, which is not affected by the thinner and solvents. They should also be furnished with an ointment consisting of anhydrous lanolin and olive oil to rub into the skin before and after work. Those workers whose skins already show the drying, cracking effect of these solvents should be provided with the sulfonated castor oil-wetting agent mixture, described under anodizing, for washing the hands instead of the ordinary soaps and cleansers.

PASSIVATING

The tanks containing nitric acid solution in which this operation is performed should be closed and vented and the workers around it should wear impervious sleeves, aprons, and gloves to protect them from the fumes of nitric acid.

PLANISHING

Planishing consists in smoothing dents from small metal parts by means of electric hammers. Oil and grease are used on the metal parts and the workers become splashed with the oil. They should wear protective clothing, sleeves, gloves, and aprons, to protect them from oil dermatitis.

PLASTER SHOP

Here the men are engaged in making plaster casts in which the molds are made. A compound consisting of stearic acid in coal oil is put on the plaster to prevent it from sticking to the molds. Dermatitis develops among some of the men from the defatting action of the coal oil. It would be advisable to substitute a vegetable oil such as castor oil or linseed oil for the coal oil in order to prevent dermatitis.

PLATING

Only cadmium plating is done. The parts to be cadmium plated are first sandblasted and then degreased by washing in strong alkali

soap. They are then dried and immersed in a plating solution which contains about 4 percent of sodium cyanide. The plating tanks are usually well vented, but accidental splashes and drippings from the metal parts may fall on the workers. Therefore, they should wear protective clothing in the form of impervious gloves, sleeves, and aprons, and it would also be advisable to have them insert vaseline into the nostrils to prevent possible nasal mucitis from cyanide fumes that may escape from the tanks.

TUBING DEPARTMENT

In the tubing department, workers cleaning and painting tubes should wear aprons, sleeves, and rubber gloves because dermatitis has occurred among workers from the cleaners and paints. Some cases have also occurred from copper tubing, probably caused by the lacquer which is applied to some of the tubing.

Oil is run through the tubing, which constitutes the chassis of the fuselage of the plane, in order to act as a protective against rust. The workers engaged in this operation are splashed with the oil and should wear gloves, boots, aprons, and sleeves of an oilproof material.

WELDING

Metal parts are welded together by electric welding, by oxy-acetylene welding, or by the so-called spot welding. Parts made of dural or of stainless steel are welded together by the use of fluxes containing fluorides. The workers lean over the flame of the welding torch and their faces are exposed to the fluoride fumes given off during the operation. Nasal mucitis, as evidenced by nose bleed and ulceration of the nasal septum, occurs among these workers. They should insert vaseline into the nostrils several times a day to prevent this condition.

In spot welding, a mixture of hydrofluoric acid and tragacanth is brushed on the metal to act as a flux. The men brushing it on and washing it off should wear rubber gloves, impervious sleeves, and aprons to prevent hydrofluoric acid burns, and they should also insert vaseline into the nostrils. These same precautions should be observed wherever a flux containing a fluoride, zinc chloride, or chromic acid is used.

WOOD SHOP

Here the various parts requiring wood are made. In some of the wood shops, dermatitis has occurred from a wood known as Honduras mahogany or to the workers as "Tabasco" mahogany because of its irritant properties. The dust of this wood is said to be irritating to a considerable percentage of the workers. Only such workers as are known to be nonsusceptible should be permitted to work with this wood.

X-RAY

Many of the metal parts of the plane are X-rayed for defects. The machines used are powerful and totally enclosed, and those handling them are well protected against X-ray exposure. No dermatitis or burns of the skin were found in this department.

ZINC CHROMATE

Zinc chromate is the pigment that is used to the greatest extent on the metal parts of airplanes. It is applied both for purposes of a filler and a paint. It is sprayed on or applied by hand brush. Several cases of dermatitis were found among persons showing by patch test a hypersensitivity to the zinc chromate itself. The prevention of dermatitis from zinc chromate has been mentioned previously under the discussion of hazards occurring in the paint shop.

SUMMARY

An inspection of airplane plants employing over 100,000 men shows that there are many skin hazards in airplane manufacture.

The principal ones are those from cutting oils, thinners, and solvents used in paints and "dopes," plating and rustproofing of metals, fluxes used in welding, and solvents used for cleaning and degreasing.

Preventive measures consisting of wearing of impervious clothing, the use of protective ointments, and the use of nonirritating skin cleansers, in addition to proper general and local ventilation, are described.

A PROTECTION TEST IN MICE FOR IDENTIFICATION OF LEPTOSPIROSIS ICTEROHAEMORRHAGICA (WEIL'S DISEASE) [1]

By Carl L. Larson, *Assistant Surgeon, United States Public Health Service*

Demonstration of the uniform susceptibility of young white mice (*Mus musculus*) to *Leptospira icterohaemorrhagiae* (*1*) made it possible to develop a mouse protection test which is specific for leptospirosis icterohaemorrhagica. The data presented in this paper show the value of the test in differentiating Weil's disease from other diseases which are apt to be confused with it.

Konar, Roy, and De (*2*) include influenza, infectious jaundice, secondary syphilis, septicemia, malaria, blackwater fever, dengue, typhus fever, and yellow fever in the differential diagnosis of Weil's disease. Soper (*3*) points out that the latter disease must be distinguished from yellow fever and this is especially emphasized in view

[1] From the Division of Infectious Diseases, National Institute of Health.

of the confusion which led Noguchi (*4*) erroneously to report *L. icteroides* as the etiologic agent of yellow fever. Fairley (*5*), Davidson et al. (*6*), Schüffner (*7*), and Walch-Sorgdrager (*8*) have pointed out that as many as 60 percent of patients infected with *L. icterohaemorrhagiae* may be anicteric and Weil's disease may be overlooked because this symptom is lacking.

In most cases of Weil's disease laboratory methods must be resorted to in order to establish a diagnosis firmly. The organism can be isolated from blood or urine before death or from post-mortem material by cultivation on Verwoort's or other suitable medium, or by transmission to susceptible animals. Davidson et al. (*6*) isolated leptospirae from the blood in 9 of 22 patients, and from the urine in 5 of 64 attempts.

Agglutinins, lysins, and complement-fixing antibodies are developed during the second week of illness and tests for their presence and increase in titer are made to confirm the clinical diagnosis in the majority of instances. The adhesion test adapted by Brown and Davis (*9*) and the agglutination-lysis test of Schüffner and Mochtar (*10*) are the most widely used serological aids. Schüffner (*7*) states that agglutinins may persist in the blood of recovered patients for at least 8 years, and Fairley (*11*) demonstrated their presence 12 years after onset of the disease. Davidson (*12*) used the agglutination test to diagnose subclinical and asymptomatic cases in retrospect.

Pfeiffer's phenomenon and immune reactions among guinea pigs have been demonstrated by Inada and his coworkers (*13*) but these results have not been applied to any great extent.

The methods mentioned above for laboratory studies of Weil's disease present difficulties of technique and interpretation which make it desirable to describe the findings concerning a specific mouse protection test against *L. icterohaemorrhagiae*.

MATERIALS AND METHODS

L. icterohaemorrhagiae, strain 1653, was used as the infectious agent throughout most of the work. It was originally isolated by Dr. A. Packchanian from a wild rat trapped in Washington, D. C. It is highly pathogenic for 3-week-old white mice and has been carried through a number of generations in mice since June 20, 1940. Strain 11, used occasionally, was isolated directly in white mice from the kidney of a wild rat trapped in Arlington County, Virginia. It has been transferred from mice to mice since July 12, 1940, and is also highly pathogenic for them.

It is necessary that young white mice, 3 to 4 weeks old, be used, in order to obtain maximum mortality in experimental leptospirosis, and mice of this age, bred at the National Institute of Health, have been employed routinely as test animals.

The test is carried out in the following manner. The kidneys and liver of a mouse dead or dying of leptospirosis are removed, weighed, and transferred to a mortar. They are finely ground with the aid of an abrasive, and sufficient normal saline solution is added to make a 10 percent suspension. The presence of leptospirae in the suspension should be checked by dark-field examination. Further 10-fold dilutions of this suspension, which have been allowed to settle by gravity, are made so that final dilutions from 10^{-1} to 10^{-5} are obtained. The serums to be tested are diluted to 10^{-1} with saline and passed through a Berkefeld N filter in order to insure sterility. Equal quantities of serum diluted to 10^{-1} and tissue suspensions diluted to 10^{-2} are mixed and allowed to stand at room temperature for 1 to 2 hours. Ten mice are inoculated intraperitoneally with 0.3 cc. of each dilution of tissue suspension and a similar number with 0.6 cc. of each serum-tissue mixture to be tested. In this way equal quantities of the infectious agent contained in a 10^{-2} dilution of infected tissue is given to each mouse to which this dilution of material is administered. The infectious agent has been titrated in the experiments to be reported.

The mice are observed for 2 weeks after inoculation before the experiment is terminated and the animals discarded. Mice dying before the fourth day following injection are not included in the final results of the test (*14*) as they die of secondary infection, trauma, or other conditions not directly due to the agent in question. All mice surviving this period are carefully observed for the development of jaundice, and all deaths are recorded. Observations are made daily at 8:30 a. m. in order to decrease the error in the noted survival time of individual animals. Protection is stated in terms of mice surviving 14 days compared to those still alive 4 days after inoculation.

The serums used in these studies were obtained from cases of Weil's disease and from cases of infectious jaundice, syphilis, typhus fever, "Q" fever, tularemia, malaria, poliomyelitis, rat-bite fever, and influenza, in order to determine the specificity of the test. Samples of serum from animals immunized against Rocky Mountain spotted fever virus, influenza virus, *L. canicola,* and *L. icterohaemorrhagiae* were likewise examined. Material was also obtained from animals suffering from, or recovered from, rat-bite fever, relapsing fever, and syphilis, as well as from normal rats and humans.

One sample of blood from a dog with leptospirosis was obtained from Dr. J. C. Lange, Greensboro, N. C. It agglutinated *L. canicola* to a titer of 1:1000 and *L. icterohaemorrhagiae* to a titer of 1:100.

The various rat serums (*R. norvegicus*) studied are listed in table 1, together with data relating to the diagnosis of leptospirosis in these animals. The serums of 15 wild rats were examined. Thirteen of these rats gave positive agglutination tests for the organism, having titers varying from 1:100 to 1:100,000. *L. icterohaemorrhagiae*

was noted by dark-field examination of the kidneys of 10 of them, isolated by animal transmission in 3 instances and cultured on Verwoort's medium from 7 others.

TABLE 1.—*Data concerning leptospirosis in wild rats (R. norvegicus), the serums of which were tested for the presence of protective antibodies against L. icterohaemorrhagiae*

Rat No.	Origin	Date examined	Titer of agglutination vs. *L. icterohaemorrhagiae*	*L. icterohaemorrhagiae* isolated by culture	*L. icterohaemorrhagiae* isolated by animal inoculation	*L. icterohaemorrhagiae* seen microscopically (dark-field kidney)
A8	Arlington, Va	July 12, 1940	1:100	+	+	−
A9	do	do	1:100	−	−	+
A11	do	do	1:100	+	+	+
A12	do	do	1:1,000	+	−	+
A17	do	July 13, 1940	1:10,000	−	−	−
A19	do	July 15, 1940	1:1,000	−	−	+
A20	do	do	1:1,000	+	−	+
A24	do	July 16, 1940	Negative	−	−	−
A25	do	July 29, 1940	1:1,000	+	+	+
A30	do	July 30, 1940	Negative	−	−	−
A48	Washington, D. C	Aug. 21, 1940	1:10,000	−	−	+
A50	do	Aug. 22, 1940	1:10,000	+	−	+
A52	do	Aug. 23, 1940	1:100,000	−	−	−
A55	do	do	1:1,000	+	−	+
A57	do	Aug. 27, 1940	1:10,000	−	−	+

In table 2 is listed information concerning the 25 human cases of leptospirosis whose serums were tested for the occurrence of protective antibodies. The data available show that from a clinical viewpoint these cases were typical of Weil's disease, since jaundice, fever, and leucocytosis characterized the infection. This view is further enhanced by the results of laboratory investigation of the agglutinin content of the blood. Serum from case 1 was examined on three occasions during the course of illness. Sample A, taken on December 6, 1940, the sixth day of the disease, failed to agglutinate *L. icterohaemorrhagiae*. Four days later sample B showed a titer of 1:10,000, and in about 3 weeks the titer of sample C had increased to 1:100,000. Case 4 had Weil's disease in 1935. At the time of illness the patient's serum agglutinated *L. icterohaemorrhagiae* to a titer of 1:80,000. In 1937 when an agglutination test was performed against this organism in Uhlenhuth's laboratory the titer had fallen to 1:6,000 and by 1940 the titer had decreased to 1:250. Cases 2 and 3 were ill in 1938 and serum was obtained in July 1940, about 2 years later. The serums of Cases 7 and 21 were tested 18 and 16 months, respectively, after onset of Weil's disease. The fact that we were able to study serums taken during the time antibodies were developing, when antibodies were at their height, and as late as 5 years after onset of symptoms enables us to measure the protective value of serum through all phases of the disease.

TABLE 2.—*Summary of human cases of Weil's disease whose serum was tested for presence of protective antibodies against L. icterohaemorrhagiae*

Case No.	Location	Name	Age	Sex	Color	Date of onset	Occupation	Presence of: Jaundice	Presence of: Fever	Presence of: Leucocytosis	*L. icterohaemorrhagiae* isolated	Result of agglutination test vs. *L. icterohaemorrhagiae*
1	Richmond, Va.	GM	25	♂	C	Dec. 1, 1940	Poultry picker	+	+	+		(a) Negative. (b) 1:10,000. (c) 1:100,000.
2	Jefferson Co., Ala.	RC		♂		1938	Coal miner	+	+			1:100.
3	Cincinnati, Ohio	WD	48	♂	C	Mar. 3, 1940	Ditch digger	+	−	+	+	1:10,000.
4	Worcester, Mass.	ED				1935						1:250.
5	Atlanta, Ga.	TH	23	♂	W	July 25, 1940		+	+	+		1:100,000.
6	New Britain, Conn.	CL	47	♂	W	Aug. 1, 1940	Salesman	+	+	+		1:100,000.
7	Milwaukee, Wis.	CB	51	♂	W	May 27, 1939	Sewer worker	+	+			1 1,000.
8	Philadelphia, Pa.	JW	18	♂	W		Unemployed	+	+	+		1·1,250.
9	Chelsea, Mass.	SL	40	♂	W	Sept. 16, 1940	Fish cutter	+	+			1.10,000.
10	Baltimore, Md.	SE		♂		Dec. 10, 1940	Poultry picker	+	+	+	+	1:100,000.
11	do	PE	50	♀	C	Aug. 19, 1940		+	+	+	+	1:100.000.
12	Philadelphia, Pa.	GK	18	♂	W	Aug. 18, 1940	Unemployed (Picked up a rat).	+	+			1:100,000.
13	Jefferson Co., Ala.	RS	24	♂	W	Oct. 31, 1938	Miner	+	+			1:1,000.
14	Puerto Rico	ED	39	♂	W	Nov. 5, 1940	Farmer	+	+	+		1:100,000.
15	Milwaukee, Wis.	CS	27	♂	W	January, 1941	Slaughter-house worker	+	+	+	+	1:100,000.
16	Chelsea, Mass.	RT	48	♂	W	Jan. 4, 1941	Fish cutter	+	+	+		1:10,000.
17	Cincinnati, Ohio	GL		♂		July, 1940		+	+	+		1:10,000.
18	Jefferson Co., Ala.	CF	39	♂	W	June 19, 1940	Miner	+	+	+		1:3,000.
19	do	RQ		♂	C	Aug. 9, 1940	do	+	+			1:1,000
20	do	BM	27	♂	W	Mar. 27, 1939	do	+	+	+		1:1.000.
21	Cincinnati, Ohio	HA	21	♂	W	Sept. 28, 1939	Laborer	+	+	+		1:100.
22	Detroit, Mich.	JE					No data					1:100,000.
23	Hartford, Conn.	?3073					No data					1:10,000.
24	Milwaukee, Wis.	?	48	♂	W		Sewer worker	+	+	+		1:1,000.
25	Jefferson Co., Ala.	LR		♂	C	May 25, 1940	Miner					1:100,000.

EXPERIMENTAL

Test of protection afforded mice infected with L. icterohaemorrhagiae by serums from cases of infectious jaundice and Weil's disease.—Serums from cases of infectious jaundice were obtained from five persons who contracted the disease in Jenkins County, Georgia, in the fall of 1940 and these, together with serums from nine cases of Weil's disease, were tested at the same time. The test was made in the manner previously described and the results are given in table 3.

TABLE 3.—*Results of testing for presence of protective antibodies against L. icterohaemorrhagiae in serums from cases of infectious jaundice and Weil's disease*

Serum	Type of serum	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Date of inoculation[1]	Number of deaths, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of protection
					1	2	3	4	5	6	7	8	9	10	11	12	13	14			
CL 44	Infectious jaundice	Human	Negative	Dec. 17, 1940						1			5	1	1		1		10	1	1/10
CL 57	do	do	do	do						1			8				1		10	0	0/10
CL 58	do	do	do	do							4	4	1		1				10	0	0/10
CL 59	do	do	do	do								6	1		2		1		10	0	0/10
CL 60	do	do	do	do								7	3						10	0	0/10
1 (a)	Weil's disease	do	do	do								1	3	1	1		3		10	1	1/10
1 (b)	do	do	1:10,000	do											2				10	8	8/10
2	do	do	1:100	do		1				1							2		9	6	6/9
3	do	do	1:10,000	do		1	2												7	7	7/7
4	do	do	1:250	do		1													9	9	9/9
5	do	do	1:100,000	do															10	10	10/10
6	do	do	1:100,000	do															10	10	10/10
7	do	do	1:1,000	do															10	10	10/10
8	do	do	1:1,250	do															10	10	10/10
9	do	do	1:10,000	do															10	10	10/10

TITRATION OF INFECTIVE AGENT FOR MINIMAL FATAL DOSE (NO SERUM)

Dilution of infective tissue emulsions (dose, 0.3 cc.)	Date of inoculation	Mice dying, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of survival
		1	2	3	4	5	6	7	8	9	10	11	12	13	14			
10^{-1}	Dec. 17, 1940						4		6							10	0	0/10
10^{-2} [2]	do								10							10	0	0/10
10^{-3}	do								8	2						10	0	0/10
10^{-4}	do									1	2	1		1		10	5	5/10
10^{-5}	do															10	10	10/10

[1] Test dose of serum-leptospira mixture, 0.3 cc. 10^{-1} dilution of serum +.3 cc. 10^{-2} suspension of leptospira infected tissue.
[2] Dilution of leptospira infected tissue employed in serum mixture.

It is apparent that none of the 5 serums from cases of infectious jaundice (CL 44, 57, 58, 59, and 60) protected mice against infection with a tissue suspension containing *L. icterohaemorrhagiae.* Only 1 of 50 mice so treated survived. Among the 10 samples of serum originating from cases of Weil's disease, 7 protected all of the mice surviving until the fourth day after inoculation. Included in these are the serums from Case 4 which were taken 5 years after onset of Weil's disease, and from Case 7 which were examined 18 months after the original illness. Serum from Case 2 protected only 6 of 9 mice. This sample had an agglutination titer of 1:100 and was drawn 2 years after the patient had been ill. The first sample of serum from Case 1, taken on the sixth day of illness, contained no antibodies capable of shielding mice against leptospirosis, but the second lot, drawn on the tenth day, protected 8 of 10 mice injected with it.

Test of protective ability of syphilitic serum and of serum from cases of Weil's disease, and from rabbits immunized against L. icterohaemorrhagiae.—A test was set up to determine whether or not serum taken from syphilitic patients having positive Wassermann reactions was capable of protecting young white mice against leptospirosis. Six serums obtained from the Naval Medical School, Washington, D. C., gave strongly positive Wassermann reactions. They were tested together with 5 serums from patients with Weil's disease and 3 from rabbits (R–11, R–S, R–1653) immunized against *L. icterohaemorrhagiae.*

TABLE 4.—*Results of testing for presence of protective antibodies against L. icterohaemorrhagiae in serums from cases of syphilis and Weil's disease, and from rabbits immunized with this organism*

Serum	Type of serum	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Date of inoculation	Number of deaths, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of protection
					1	2	3	4	5	6	7	8	9	10	11	12	13	14			
A	Syphilis	Human	Negative	Jan. 6, 1941						1	8	1							10	0	0/10
B	do	do	Negative	do						1	2	7							10	0	0/10
C	do	do	Negative	do	1					2	6	1							9	0	0/9
D	do	do	Negative	do		1				1	2		3	1					9	2	2/9
E	do	do	Negative	do						3	4	3							10	0	0/10
F	do	do	Negative	do						2	6	2							10	0	0/10
10	Weil's disease	do	1:100,000	do								1							10	9	9/10
11	do	do	1:100,000	do															10	10	10/10
1 (c)	do	do	1:100,000	do										2					10	8	8/10
12	do	do	1:100,000	do															10	10	10/10
13	do	do	1:1,000	do	1														9	9	9/9
R1603	Anti-icterohaemorrhagiae	Rabbit	1:1,000,000	do															10	10	10/10
R8	do	do	1:1,000,000	do															10	10	10/10
R11	do	do	1:1,000,000	do															10	10	10/10

TITRATION OF INFECTIVE AGENT FOR MINIMAL FATAL DOSE (NO SERUM)

Dilution of infective tissue emulsions (dose, 0.3 cc.)	Date of inoculation	Mice dying, by days														Survivors at end of 4 days	Survivors at end of 14 days
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
10^{-1}	Jan. 6, 1941						6	3		1						10	0
10^{-2}	do					1	2	3	3	1						10	0
10^{-3}	do								3	2	3	1				10	1
10^{-4}	do															10	10
10^{-5}	do															10	10

The results obtained show conclusively that no antibodies against *L. icterohaemorrhagiae* were present among the small group of syphilis serums examined (table 4).

A serum (Case 13) obtained 2 years after Weil's disease appeared afforded ample protection to mice to which it was administered, as did serum from Case 1 (C) examined about 3 weeks after onset of illness. Serums from the 3 rabbits immunized against *L. icterohaemorrhagiae* fully protected mice against leptospirosis.

Test of protection afforded by yellow fever immune serums and by serums from cases of Weil's disease, and from rabbits immunized against L. canicola.—Yellow fever antiserum was drawn from individuals who had been immunized with attenuated yellow fever virus at the Rocky Mountain Laboratory, Hamilton, Mont. None of the subjects had ever had jaundice prior to immunization. The immunization procedure induced the production of antibodies against yellow fever virus as shown by mouse protection tests. No agglutinins against either *L. canicola* or *L. icterohaemorrhagiae* could be demonstrated (table 5). When tested for the presence of protective antibodies against this latter organism none of these serums protected mice, while 4 specimens of serum from cases of Weil's disease containing agglutinins against *L. icterohaemorrhagiae* protected at least 9 of the 10 mice into which they were inoculated. Serum from rabbits (P–b, P–c) immunized against *L. canicola* either failed entirely to protect mice or gave equivocal results. In 1 case, only 1 of 10 mice with murine leptospirosis survived after having been given a mixture of anti-canicola serum and infective tissue, and in another case 4 of 10 mice died after being subjected to the same procedure.

TABLE 5.—*Results of testing for presence of protective antibodies against L. icterohaemorrhagiae in serums from cases of yellow fever, Weil's disease, and from rabbits immunized with L. canicola*

Serum	Type of serum	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Date of inoculation	Number of deaths, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of protection
					1	2	3	4	5	6	7	8	9	10	11	12	13	14			
82	Yellow fever	Human	Negative	Jan. 28 1941						1	2	4	1	1					10	1	1/10
83	do	do	do	do						2	4	2	1						10	1	1/10
84	do	do	do	do						1	1		2		1	1	2		10	2	2/10
85	do	do	do	do							2	1	1			1	1	2	10	2	2/10
86	do	do	do	do							3	2	3			1			10	1	1/10
87	do	do	do	do							5	4	1						10	0	0/10
P-b	Anticanicola	Rabbit	10^{-2}	do							4	3			1		1		10	0	0/10
P-e	do	do	10^{-3}	do							1		2	1					10	6	6/10
14	Weil's disease	Human	10^{-6}	do															10	10	10/10
15	do	do	10^{-5}	do								1							10	9	9/10
16	do	do	10^{-4}	do											1				10	9	9/10
10	do	do	10^{-6}	do															10	10	10/10

TITRATION OF INFECTIVE AGENT FOR MINIMAL FATAL DOSE (NO SERUM)

Dilution of infective tissue emulsions (dose, 0.3 cc.)	Date of inoculation	Mice dying, by days														Survivors at end of 4 days	Survivors at end of 14 days
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
10^{-1}	Jan. 28 1941					1	1	3	2	2			2			10	0
10^{-2}	do							2	4	4						10	0
10^{-3}	do														2	10	8
10^{-4}	do															10	10
10^{-5}	do															10	10

Further tests of the ability of various types of antisera to protect mice infected with L. icterohaemorrhagiae.—Tests were carried out on 25 other samples of serum which originated from various sources other than Weil's disease. Poliomyelitis antiserum from 2 cases occurring near Charleston, S. C., were found to possess protective antibodies against poliomyelitis virus. The samples from those persons with "Q" fever and typhus fever also had antibodies against the respective etiologic agents. Specimens from 2 cases of malaria were studied; one of these was taken during the height of fever, while the other was taken during an afebrile period. An influenza serum originated from a case in San Diego, Calif., and was shown to have antibodies capable of protecting mice against infection with this virus. Material from 3 cases of tularemia possessed agglutinins to a high titer for *B. tularense,* and that from a single case of rat-bite fever of the Haverhill type agglutinated *Streptobacillus moniliformis.* All of the cases from which serum was obtained were characteristic of the disease involved, and in no instance were agglutinins for *L. canicola* or *L. icterohaemorrhagiae* demonstrated.

The serums of 4 guinea pigs having *Spirillum minus* in their blood were tested for protective antibodies against leptospirae. A rabbit infected with *Treponema pallidum* presented an active local lesion at the time blood was obtained for experimental use. A specimen of serum from a rabbit which had been hyperimmunized against Rocky Mountain spotted fever virus contained protective antibodies against that virus. Five monkeys exposed to relapsing fever were also studied; one specimen of serum (364) was taken when the monkey was ill and the others 6 months after the last exposure of the animals to *Spirochaeta recurrentis.* The organism had been noted in all of them at some stage of the disease. No agglutinins for leptospirae were found in any of the samples of serum discussed. Various members of the Public Health Service supplied most of the material examined.

Table 6 shows the results of agglutination tests against *L. icterohaemorrhagiae* and of protection tests against murine leptospirosis performed with these specimens. It will be noticed that they contained neither agglutinins nor protective antibodies against the leptospirae. While the number of samples studied from each disease is necessarily small, the results obtained appear to show that the test is specific. At the time the above serums were being examined a group of 22 samples taken from persons and rats with leptospirosis were also studied and served as controls for the former group. The results of the agglutination and protection tests are shown in table 7.

TABLE 6.—*Results of testing for the presence of protective antibodies against L. icterohaemorrhagiae in serums derived from miscellaneous sources*

Serum	Type of serum	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Number of deaths, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of protection
				1	2	3	4	5	6	7	8	9	10	11	12	13	14			
232-3	Malaria	Human	Negative					2		1	5	2						10	0	0/10
246-A	do	do	do							5	3	2						10	0	0/10
ML	Poliomyelitis	do	do							3	5	2						10	0	0/10
AB	do	do	do							6	1		3					10	0	0/10
450	Syphilis	Rabbit	do				2	1	1	5	1							8	0	0/8
JY	Rat-bite fever (Haverhill)	Human	do							3	2		2					10	3	3/10
223	Rat-bite fever (S. minus)	Guinea pig	do	1							7	2						9	0	0/9
232	do	do	do		1		1			2	1	5						8	0	0/8
253	do	do	do								5	5						10	0	0/10
262	do	do	do							1	6	1	1					10	1	1/10
918	Relapsing fever	Monkey	do						5		4	1						10	0	0/10
364	do	do	do						4		4	1						10	1	1/10
67	do	do	do						4		5	1						10	0	0/10
75	do	do	do		1	1					6	2						8	0	0/8
357	do	do	do						4		4						1	10	1	1/10
12844	Tularemia	Human	do			1		1	1		5	2						9	0	0/9
19252	do	do	do						6		4							10	0	0/10
13010	do	do	do			1			1		6	1		1				9	0	0/9
FSU	Influenza	do	do							5	3	1	1					10	0	0/10
451	do	Rabbit	do						1	2	2	2	2					10	1	1/10
452	Rocky Mountain spotted fever	do	do						1	3	2	3	1					10	0	0/10
RN	"Q" fever	Human	do							3	1	3	1	1				10	1	1/10
EM	do	do	do							4	3	3						10	0	0/10
MT	Typhus fever	do	do						2	1	5	2						10	0	0/10
IB	do	do	do						2	2	2		2		1			10	1	1/10

TABLE 7.—*Results of testing for the presence of protective antibodies against L. icterohaemorrhagiae in serums from cases of murine, canine, and human leptospirosis*

Serum	Type of serum	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Number of deaths, by days														Survivors at end of 4 days	Survivors at end of 14 days	Ratio of protection
				1	2	3	4	5	6	7	8	9	10	11	12	13	14			
A8	Leptospirosis	Rat	1:100			1												9	9	9/9
A11	do	do	1:100											1				10	9	9/10
A20	do	do	1:1,000					1		1								10	8	8/10
A50	do	do	1:10,000			1	1											8	8	8/8
A52	do	do	1:100,000			1												9	9	9/9
A55	do	do	1:1,000															10	10	10/10
A57	do	do	1:10,000					1										10	9	9/10
A12	do	do	1:1,000															10	10	10/10
A25	do	do	1:1,000				1											9	9	9/9
A48	do	do	1:10,000															10	10	10/10
CL56	do	Dog	1:1,000												1			10	9	9/10
14	do	Human	1:100,000			1												9	9	9/9
17	do	do	1:10,000															10	10	10/10
18	do	do	1:3,000															10	10	10/10
19	do	do	1:1,000															10	10	10/10
20	do	do	1:1,000					1										10	9	9/10
21	do	do	1:100		1	1												8	8	8/8
22	do	do	1:100,000															10	10	10/10
23	do	do	1:10,000															10	10	10/10
8	do	do	1:1,250															10	10	10/10
10	do	do	1:100,000															10	10	10/10
15	do	do	1:100,000													2		10	8	8/10

It is readily seen that serum developed in the presence of leptospirosis acts specifically to preserve mice against infection due to *L. icterohaemorrhagiae*. While only 10 of 241 mice (4.1 percent) treated with nonspecific serum and which survived the fourth day following inoculation recovered from the infection, 204 of 212 mice (96.2 percent) treated with specific serum failed to develop leptospirosis and remained well during the period of observation. In the main, those diseases which may be confused, clinically, with leptospiral jaundice are easily differentiated from it by the mouse protection test.

Titration of protective ability of leptospiral antiserums.—An attempt was made to determine whether the protective ability of serum possessing agglutinins against *L. icterohaemorrhagiae* varies in relation to the agglutinin content. Table 8 shows the results obtained using 2 negative serums, 2 with agglutinins to a titer of 1:100, one with a titer of 1:1,250, 3 having titers of 1:1,000, 3 with titers of 1:10,000, and 2 with agglutinins to a titer of 1:100,000 against this organism. There is a wide range (1.78×10^{-3}) of protection afforded by these serums, as measured by the 50 percent end point method. While the ability of serum to protect mice generally increases as the agglutinin content increases, this does not necessarily hold in all cases. Thus, the greatest protection was afforded mice by injection of a serum (8) containing agglutinins to a titer of only 1 : 1,250, while one serum (25) with a titer of 1:100,000 had a 50 percent end point of only 2.37×10^{-2}. One serum (13) drawn 2 years after injection had a 50 percent end point of 2.68×10^{-2}. The relation between protecting ability and agglutinin content does not remain constant. A low concentration of protective antibodies may be encountered in the presence of abundant agglutinins and the reverse may also hold.

TABLE 8.—*Results of titration of protective antibodies against L. icterohaemorrhagiae contained in serums from rats and humans with leptospirosis*

Serum No.	Source of serum	Agglutination titer vs. *L. icterohaemorrhagiae*	Number of mice used	Serum dilution					50 percent end point
				10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	
5	Human	1:100,000	5	[1] 5/5	5/5	2/5	1/5	0/5	1×10^{-3}.
25	do	1:100,000	5	4/5	4/5	1/5	0/5	0/5	2.37×10^{-2}.
A17	Rat	1:10,000	5	5/5	5/5	0/5	0/5	0/5	3.16×10^{-2}.
3	Human	1:10,000	5	5/5	3/5	0/5	0/5	0/5	4.68×10^{-2}.
A27	Rat	1:10,000	5	5/5	3/5	0/5	0/5	0/5	4.68×10^{-2}.
8	Human	1:1,250	5	4/5	5/5	4/5	0/5	0/5	1.78×10^{-3}.
A19	Rat	1:1,000	5	5/5	5/5	1/5	0/5	0/5	4.22×10^{-2}.
24	Human	1:1,000	6	6/6	5/6	1/6	0/6	0/6	3.16×10^{-2}.
13	do	1:1,000	5	5/5	4/5	0/5	0/5	0/5	2.68×10^{-2}.
2	do	1:100	5	4/5	0/5	0/5	0/5	0/5	2.37×10^{-1}.
A9	Rat	1:100	6	6/6	0/6	0/6	0/6	0/6	3.20×10^{-1}.
A24	do	Negative	5	0/5	0/5	0/5	0/5	0/5	0.
A30	do	Negative	5	0/5	0/5	0/5	0/5	0/5	0.

[1] Numerator = number of mice surviving; denominator = number of mice inoculated.

DISCUSSION

The data presented show that serum obtained from individuals or from animals which have been infected with, or immunized against, *L. icterohaemorrhagiae* possesses antibodies capable of preventing young white mice from becoming infected with this organism when serum and tissue suspension containing leptospirae are mixed *in vitro* before injection into the animals. Such serums also contain specific agglutinins for the organism. The fact that such antibodies could be demonstrated in this material suggests the use of a mouse protection test for diagnostic and laboratory procedures in studies of Weil's disease.

Serums derived from cases of disease other than leptospirosis were examined in order to ascertain whether the test was specific. In none of them were either agglutinins or protective antibodies demonstrated. With the exception of dengue fever and blackwater fever, material from all diseases usually considered in the differential diagnosis of leptospirosis was examined, with negative results. The protective antibodies produced in animals following contact with *L. icterohaemorrhagiae* possess a specific affinity for these organisms and are not produced in response to infections of the other diseases studied.

Protective antibodies appear in the blood stream in about 2 weeks following the onset of illness at about the same time as agglutinins become evident. They remain in the serum of individuals who have recovered from Weil's disease for a period of at least 5 years. In cases where the clinical diagnosis of Weil's disease has not been made or where the agglutination titer of the serum is so low as to be of a controversial nature, the protection test serves as a specific and sensitive diagnostic procedure.

Although the protective antibody content of serum from Weil's disease patients and from rats infected with *L. icterohaemorrhagiae* has a certain general relation to the agglutination titer, this has been shown to hold only to a limited degree. The mouse test would probably not be of significance in attempting to follow the course of illness by measuring the titer of antibodies developed as the disease progresses.

In the few tests which have been made using serums from rabbits hyperimmunized against *L. canicola* to protect mice against infections with *L. icterohaemorrhagiae*, it appears that there is a marked inability of such serums to act against heterologous leptospirae. This is of especial interest when the marked protection afforded by the single serum obtained from a dog suffering from leptospirosis is noted. Although it agglutinated *L. canicola* to a titer of 1:1000 and *L. icterohaemorrhagiae* to a titer of only 1:100, it protected 9 of 10 mice infected with the latter organism.

CONCLUSIONS

1. Serums from 25 humans, 13 wild rats, and 1 dog all suffering from leptospirosis were tested for the presence of specific protective antibodies against *L. icterohaemorrhagiae*. Material from three rabbits hyperimmunized against *L. icterohaemorrhagiae* was also tested.
2. Protective antibodies were detected in all of the above serums.
3. No protective antibodies against leptospirae were produced following influenza, malaria, poliomyelitis, Rocky Mountain spotted fever, typhus fever, "Q" fever, tularemia, rat-bite fever, relapsing fever, infectious jaundice, syphilis, and yellow fever.
4. Indefinite results were obtained with serums derived from rabbits hyperimmunized against *L. canicola*.
5. Protective antibodies develop during the second week of the disease and persist for at least 5 years.
6. The protective antibody titer roughly follows the agglutinin titer.
7. The mouse protection test devised can be used for the diagnosis of leptospirosis and offers a specific and easily interpreted test for this purpose.

REFERENCES

(*1*) Larson, C. L.: Susceptibility of young mice (*Mus musculus*) to *Leptospira icterohaemorrhagiae*. Pub. Health Rep., **56**: 1546 (1941).

(*2*) Konar, N. R., Roy, H. K., and De, M. N.: Clinical observations on Weil's disease in India. Ind. Med. Gaz., **74**: 596 (1939).

(*3*) Soper, F. L.: Yellow Fever. The Cyclopedia of Medicine, Surgery and Specialties. Vol. 15, p. 1086, F. A. Davis Company, Philadelphia, 1940.

(*4*) Noguchi, H.: Etiology of yellow fever. II. Transmission experiments on yellow fever. J. Exp. Med., **29**: 565 (1919).

(*5*) Fairley, N. H.: Leptospirosis in the British Empire. Acta Conventus Tertii de Tropicis Morbis, Pars I: 387 (1938).

(*6*) Davidson, L. S. P., and Smith, J.: Weil's disease in fishworkers: A clinical, chemical and bacteriological study of forty cases. Quart. J. Med., new series, **5**: 263 (1936).

(*7*) Schüffner, W.: Recent work on leptospirosis. Tr. Roy. Soc. Trop. Med. and Hyg., **28**: 7 (1934).

(*8*) Walch-Sorgdrager: Leptospiroses. Bull. Health Organization League of Nations, **8**: 143 (1939).

(*9*) Brown, H. C., and Davis, L. J.: The adhesion phenomenon as an aid to the differentiation of *Leptospira*. Brit. J. Exp. Path., **8**: 397 (1927).

(*10*) Schuffner, W. A. P., and Mochtar, A.: Versuche zur Aufteilung von Leptospirenstammen mit einleitenden Bemerkungen über den Verlauf von Aggultination und Lysis. Cent. f. Bakt. (Abt. I), **101**: 405 (1927).

(*11*) Fairley, N. H.: Weil's disease among sewer workers in London. Brit. Med. J., **2**: 10 (1934).

(*12*) Davidson, L. S. P.: Weil's disease: A new occupational disease in fish workers. Glasgow Med. J., **129**: 113 (1938).

(*13*) Inada, R., Ido, Y., Hoki, R., Kaneko, R., and Ito, H.: The etiology, mode of infection, and specific therapy of Weil's disease (spirochetosis icterohaemorrhagica). J. Exp. Med., **23**: 377 (1916).

(*14*) Soper, F. L., and Smith, H. H.: Vaccination with virus 17D in jungle yellow fever. Acta Conventus Tertii de Tropicis Morbis, Pars I: 295 (1938).

A STUDY OF THE RELATIVE TOXICITY OF THE MOLECULAR COMPONENTS OF LEAD ARSENATE [1]

By Lawrence T. Fairhall, *Principal Industrial Toxicologist*, and John W. Miller, *Senior Pathologist, United States Public Health Service*

The extensive use of lead arsenate in agricultural spray material is of interest to public health because of the amount of spray residue present in the marketed product. This residue consists principally of unchanged dilead orthoarsenate ($PbHAsO_4$), although as a result of weathering a portion of the material on the surface of the fruit may be converted to a more basic form having the composition $Pb_4(PbOH)(AsO_4)_3.H_2O$, according to McDonnell and Graham (*1*).

The toxic properties of lead arsenate have been variously ascribed to different portions of the molecule. The assumption has been made, for instance, that the toxicity is due to the arsenate radical, i. e., that any arsenate would serve as a poison and that lead is chosen as a vehicle merely because of the physical properties of the compound, lead arsenate. It has also been considered that lead arsenate itself is a unique poison—that the combined toxic action of lead and arsenic specifically makes lead arsenate an especially effective insecticide. Furthermore, it has been suggested that the lead and arsenic are synergistic in action, each increasing the toxicity of the other when they are administered as lead arsenate. Whether the lead itself, or the arsenate group only, or whether molecular lead arsenate is the important factor in its toxic action on animals has not so far received the experimental attention that it deserves.

It has been shown by Newcomer (*2*) that, as an insecticide at least, calcium arsenate is just as effective as lead arsenate in the control of the codling moth. More recently Fleming, Baker, and Koblitsky (*3*) have found that as insecticides various lead salts, such as the acetate, borate, carbonate, chloride, fluoride, and acid phosphate were not toxic at the concentration used, whereas the arsenates of other metals, such as aluminum, iron, and magnesium, were invariably toxic. They conclude that the insecticidal action is to be attributed entirely to the arsenate radical. While calcium arsenate is apparently effective as an insecticide some of the commercial preparations of this salt are prone to cause leaf burn due to free arsenic acid formed by hydrolysis (*4*). The use of lead arsenate has also been favored because it has a

[1] From the Division of Industrial Hygiene, National Institute of Health. This is the fifth of a series of investigations concerning lead arsenate. The preceding publications are as follows:

Fairhall, L. T., and Neal, P. A.: Absorption and excretion of lead arsenate in man. Pub. Health Rep., 53: 1231–1245 (1938). Reprint No. 1960.

Fairhall, L. T.: The solubility of lead arsenate in body fluids. Pub. Health Rep., 54: 1636–1642 (1939). Reprint No. 2097.

Fairhall, L. T., and Sayers, R. R.: The significance of the excretion of lead in the urine. Pub. Health Rep., 54: 2016–2019 (1939). Reprint No. 2113.

Fairhall, L. T., Sayers, R. R., and Miller, J. W.: The relative toxicity of lead and some of its common compounds. Pub. Health Bull. No. 253. Government Printing Office, 1940.

greater spreading or covering power, so that the protective coat is more uniform.

Nonetheless, calcium arsenate is used commercially to a large extent even as compared with lead arsenate. According to Roark (*5*), in 1936 the estimated annual consumption of calcium arsenate in the United States was 45,000,000 pounds, while that of lead arsenate was 40,000,000 pounds. A large part of the calcium arsenate so used has been employed for dusting.

While the primary interest in the toxicity of lead arsenate has in the past largely related to its insecticidal properties, an increasing interest has been shown in its toxic action on animals (*6*). The present investigation was not concerned with the degree of toxic action of lead arsenate itself, as much as with finding which portion of the molecule, i. e., the lead or the arsenic, is the principal factor as the toxic agent.

Since this question exists as to the cause of the toxic action of lead arsenate, experiments were undertaken with animals to determine whether the toxicity is due to the lead radical, to the arsenic radical, or to both.

EXPERIMENTAL PROCEDURE

White rats were fed an experimental diet over a period of 2 years. The diet consisted of wheat flour, corn meal, oat meal, dextrin, powdered milk, dried yeast, and liver powder, with the addition of an adequate mineral ration and supplemented at intervals by greenstuff. The diet was uniform except that lead arsenate was added to the diet of one group, an equivalent amount of lead as lead carbonate was added to the diet of the second, and an amount of arsenate equivalent to that of the lead-arsenate group was added as calcium arsenate to the diet of the third group. The amounts of salts were weighed, suspended in water, and thoroughly mixed with the dried food materials and the resulting dough was rolled out into thin biscuit form and lightly baked. This insured a fairly uniform distribution of intake. Calcium arsenate and lead carbonate were chosen only because of their low solubility (comparable to that of lead arsenate) and not because calcium arsenate is also used as an insecticide. A control group of rats of similar age and weight was placed on the same diet free from the substances under test. The amount of lead or arsenic in the food was so arranged that on the basis of a 10-gram ration each rat would ingest daily approximately 10 milligrams of lead arsenate, or its lead or arsenic equivalent in lead carbonate or calcium arsenate.

The young white rats used weighed from 70 to 90 grams at the beginning of the experiment and were divided according to diet as follows: Calcium arsenate 99, lead arsenate 49, lead carbonate 55,

and controls 24. A larger number of rats was used for the calcium arsenate diet because those originally set aside for this purpose were females, while all the other animals were males. For this reason a second group of male rats was added for this diet. No marked difference was found, however, in the effect of calcium arsenate on the sexes. At the beginning it was not anticipated that the experiment would extend over a period of 2 years; it was assumed that the experiment would terminate within a few months because of the large dosage of 10 milligrams a day of lead arsenate or its equivalent. No attempt was made to estimate the degree of absorption of lead or arsenic by determining the fecal and urinary output of arsenic and lead, and comparing these figures with the intake.

The indices of toxicity included mortality figures and such outward signs of morbidity as loss of weight, refusal of food, diarrhea, poor posture, and gait. Throughout the experiment, however, the indices of morbidity revealed nothing of a striking nature. Finally, the distribution of lead and arsenic in the tissues was determined and the various tissues and organs were studied microscopically for pathological changes.

A certain number of deaths occurred in the various groups in the early stage of the experiment but these were due to middle ear infection and occurred in the control group as well as the others (table 1, fig. 1). It is possible, however, that the addition of either lead arsenate, calcium arsenate, or lead carbonate to the diet of the respective groups increased the mortality from disease at this point.

TABLE 1.—*Cumulative mortality rates of rats on experimental diets*

Duration of experiment (months)	Control, 24 animals		Lead carbonate, 55 animals		Lead arsenate, 49 animals		Calcium arsenate, 99 animals	
	Total deaths	Percent deaths	Total deaths	Percent deaths	Total deaths	Percent deaths	Total deaths	Percent deaths
1	3	13	9	16	4	8	14	14
2					5	10	20	20
3	4	17	10	18			23	23
4							25	25
5					6	12	29	29
6			11	20	7	14	35	35
7							37	37
8					9	18		
9			12	22	10	20	40	40
10					13	27	41	41
11			13	24	19	39	46	46
12			14	26	22	45	48	48
13								
14							53	54
15								
16			15	27	23	47	54	55
17	5	21					55	56
18			18	33	25	51	56	57
19			19	35	27	55	58	59
20							59	60
21			20	36				
22	8	33	21	38	28	57		
23			22	40	29	59	64	65
24	10	42	23	42	30	61	66	67

At the end of the first year, approximately half of the surviving rats of each group were killed. Portions of the kidneys, liver, and spleen were set aside for pathological investigation and the remainder analyzed for lead and arsenic. The remaining animals were retained at the same level of lead or arsenic intake until the end of the second year, when they were killed and their tissues analyzed. At the end of the experiment, each rat in its respective group had received a total of approximately 7.2 grams of lead arsenate, 5.5 grams of lead carbonate, or 4.8 grams of calcium arsenate.

EXPERIMENTAL RESULTS

The mortality figures over a period of 2 years, exclusive of the animals killed, indicate a difference between the arsenate groups and

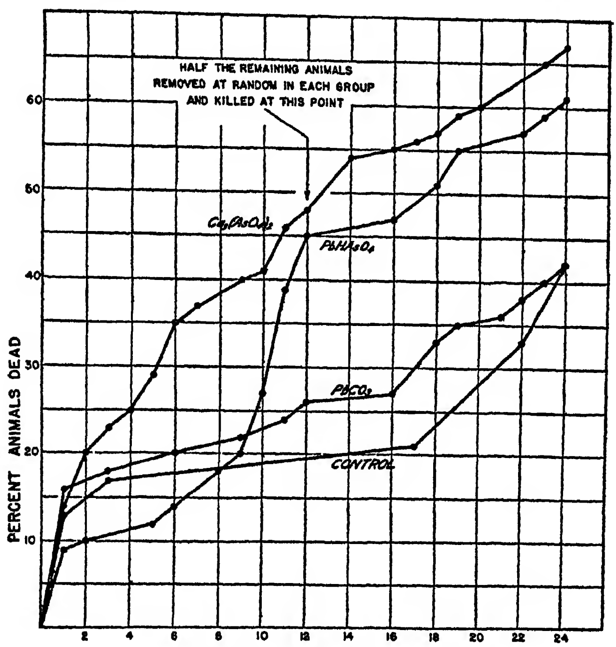


FIGURE 1.—Mortality (excluding animals sacrificed at end of first year) of white rats over a period of 2 years when fed 10 mg of lead arsenate per day or its lead or arsenate equivalent.

the carbonate group. Rats on both the lead-arsenate and the calcium-arsenate diets showed a consistently greater mortality. From the second month until the end of the 2-year period, the rate of death was highest in the calcium-arsenate group. The mortality of the animals in the several groups is shown in figure 1.

The amount of lead in the tissues was determined by ashing and analysing by the chromate method (7), or by the colorimetric diphenyl-

thiocarbazone procedure (*8*), while the arsenic content was determined by the Gutzeit method (*9*).

The distribution of lead and arsenic in the tissues, liver, kidney, and bone, expressed in terms of 10 grams of wet tissue (with the exception of a few cases where specimens were unavoidably lost) is given in table 2.

A study of these figures shows several interesting relationships. As in previous investigations (*10*) the concentration of lead is greater in the kidney than in the liver, both in the case of lead arsenate and of lead carbonate. This is true both for the 1-year group and for the 2-year group. In the 1-year lead-arsenate group the average content of lead in the liver was 0.029 mg./10 grams as compared with 0.187 mg./10 grams of kidney, while for the 2-year group the values were 0.025 mg. and 0.124 mg., respectively. In the case of lead carbonate these amounts were, respectively, 0.039 mg. and 0.499 mg. for the 1-year group and 0.019 mg. and 0.297 mg. for the 2-year group.

With respect to arsenic, the liver and kidney storage was greater than with lead in the case of lead arsenate, namely 0.177 mg. and 0.197 mg. for the 1-year group and 0.166 mg. and 0.266 mg. for the 2-year group. In the case of calcium arsenate, the amounts in the liver and kidney were 0.129 mg. and 0.733 mg., respectively, for the 1-year group, and 0.223 mg. and 0.701 mg. for the 2-year group.

Our experience has shown that the lead and the arsenic content of liver and kidney may be diminished rapidly if the animals are placed on a normal diet even a few days before death. No attempt was made to determine the decrease in arsenic content of the liver and kidney with time as determined by Blumenfeldt (*11*) for acute arsenical poisoning, but a similar relationship between the liver and kidneys as temporary reservoirs of arsenic was noted.

TABLE 2a.—*Distribution of arsenic in tissues. Calcium arsenate*

Days on test	Weight at death, grams	Grams $Ca_3(AsO_4)_2$ received (estimate)	Mg. As/10 gm. tissue		
			Liver	Kidney	Bone
	1 year				
381	163	2.5	0.202	0.580	0.023
381	168	2.5	.158	.469	.047
388	160	2.5	.104	.443	.043
388	165	2.5	.088	.300	.073
388	176	2.5	.169	.902	.018
391	158	2.5	.081	.840	.037
391	126	2.5	.170	.545	.137
391	178	2.5	.147	.721	.035
391	205	2.5	.071	.950	.072
393	166	2.6	.157	.835	.058
393	164	2.6	.150	1.418	.060
393	162	2.6	.128	.473	.064
394	172	2.6	.150	.781	.094
394	186	2.6	.073	.712	.030
394	180	2.6	.086	1.025	.071
Average	--------	--------	.129	.733	.057
	2 years				
739	210	4.8	.106	.372	.004
739	220	4.8	.131	.460	.068
740	250	4.8	.067	.311	.000
740	215	4.8	.111	.636	.001
740	200	4.8	.077	.866	.013
742	225	4.8	.110	.366	.009
742	200	4.8	.133	.536	.007
742	200	4.8	.100	.292	.007
743	220	4.8	.072	.720	.017
743	225	4.8	.160	--------	.009
743	220	4.8	.191	1.672	.011
740	356	4.8	.219	2.700	.000
740	350	4.8	.281	.346	.000
740	203	4.8	1.230	.244	.000
740	320	4.8	.283	.208	.000
740	405	4.8	.077	1.515	.000
740	390	4.8	.470	.207	.000
740	285	4.8	.232	.350	.000
Average	--------	--------	.223	.701	.008

TABLE 2b.—*Distribution of lead and arsenic in tissues. Lead arsenate*

Days on test	Weight at death, grams	Grams $PbHAsO_4$ received (estimate)	Mg. Pb/10 gm. tissue			Mg. As/10 gm. tissue		
			Liver	Kidney	Bone	Liver	Kidney	Bone
	1 year							
338	118	3.4	0.036	0.120	3.01	0.212	.067	0.048
341	142	3.4	.025	.151	3.63	.185	.081	--------
354	224	3.5	.033	.086	1.91	.109	.100	.051
378	178	3.8	.020	.236	2.77	.202	.079	.015
378	185	3.8	.031	.214	1.83	.077	.271	.018
370	204	3.8	.016	.238	1.48	.136	.143	--------
379	165	3.8	.038	.260	--------	.132	.250	--------
379	191	3.8	.042	.367	2.98	.205	.633	.103
379	230	3.8	.032	.174	3.11	.207	.110	.026
379	284	3.8	.027	.099	1.98	.200	.187	.089
351	213	3.5	.024	.086	2.21	.224	.249	.034
Average	--------	--------	.029	.187	2.49	.177	.197	.048
	2 years							
737	230	7.4	.010	.057	1.46	.116	.223	.004
737	240	7.4	.021	.037	1.37	.249	.113	.028
737	270	7.4	.021	.150	8.44	.361	.490	.003
730	265	7.3	.013	.110	--------	.236	.511	.004
737	200	7.4	.037	.159	2.81	.181	.206	.009
738	240	7.4	.034	.214	2.39	.107	.321	.004
693	230	6.9	.037	.149	2.43	.130	--------	.006
738	240	7.4	.035	.150	3.50	.092	.128	.009
738	260	7.4	.020	.045	1.13	.055	.130	.006
739	260	7.4	--------	.091	2.52	.099	.142	.002
739	250	7.4	.021	.150	1.65	.201	.400	.008
Average	--------	--------	.025	.124	2.27	.166	.266	.008

TABLE 2c.—*Distribution of lead and arsenic in tissues. Lead carbonate*

Days on test	Weight at death, grams	Grams $PbCO_3$ received (estimate)	Mg. Pb/10 gm. tissue		
			Liver	Kidney	Bone
		1 year			
343	138	2.6	0.028	0.387	3.44
367	155	2.8	.025	.417	4.83
367	192	2.8	.058	.613	3.99
367	202	2.8	.028	.444	3.37
367	116	2.8	.121	.372	4.86
352	258	2.6	.036	.351	4.00
368	229	2.8	.032	.528	3.43
368	215	2.8	.038	.643	3.99
368	225	2.8	.035	.696	2.90
371	245	2.8	.027	.642	2.84
371	211	2.8	.041	.455	5.61
371	281	2.8	.027	.417	3.28
378	230	2.8	.030	.425	4.90
378	255	2.8	.030	.594	4.45
Average			.039	.499	3.99
		2 years			
731	200	5.5	.023	.290	5.26
731	225	5.5	.027	.323	4.84
732	330	5.5	.018	.372	4.39
726	300	5.5	.016	.210	4.59
717	270	5.4	.021	.300	4.99
732	220	5.5	.024	.332	5.69
702	230	5.3	.031	.308	3.85
733	270	5.5	.024	.286	5.08
718	285	5.4	.011	.216	3.87
729	270	5.5	.009	.297	4.99
729	270	5.5	.012	.294	4.09
Average			.019	.297	4.69

TABLE 2d.—*Distribution of lead and arsenic in tissues. Controls*

Days on test	Weight at death, grams	Mg. Pb/10 gm. tissue			Mg. As/10 gm. tissue		
		Liver	Kidney	Bone	Liver	Kidney	Bone
				1 year			
395	161	0.013	0.139	0.000	0.007	0.087	0.008
395	134	.056	.050	.000	.007	.000	.000
395	213	.027	.046	.000	.017	.046	.009
395	180	.020	.050	.098	.006	.070	.016
395	164	.010	.033	.000	.010	.079	.012
Average		.025	.063	(.019)	.009	.056	.009
				2 years			
663	250	.023	.016		.020	.072	
743	250	.008	.033		.049	.060	
743	325	.003	.035		.008	.014	
743	160	.008	.041		.000	.000	
743	240	.005	.085		.037	.048	
Average		.009	.042		.023	.039	

A striking difference is apparent in the amount of lead deposited in the bone in the case of lead arsenate as compared with lead carbonate. For animals given lead arsenate, in the 1-year group the average amount of lead in bone tissue was 2.49 mg./10 grams, as compared with 3.99 mg./10 grams for animals given lead carbonate. In the

2-year group the respective figures were 2.27 mg /10 grams and 4.69 mg./10 grams. In other words, twice as much lead was deposited in the bones of those animals receiving lead carbonate as in those receiving lead arsenate, the actual amount of ingested lead being identical in each case It would therefore appear that in the presence of the arsenate radical the amount of lead absorption from the gastro-intestinal tract is either decreased, or that the excretion of lead is

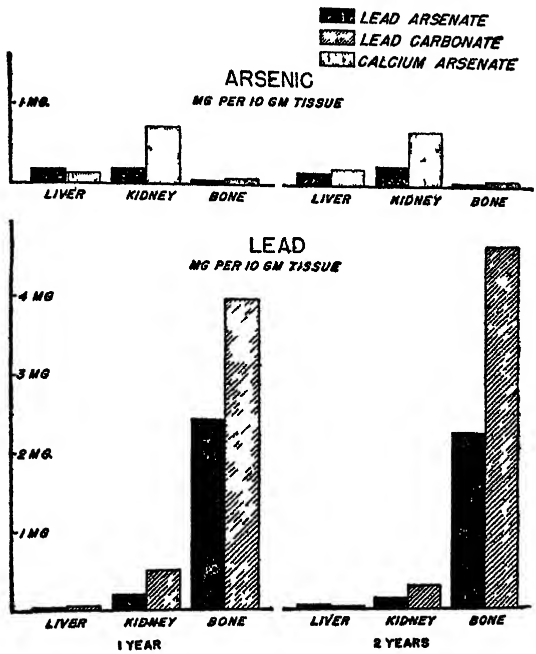


FIGURE 2—Distribution of lead and arsenic in the tissues following the ingestion of lead arsenate or its lead or arsenate equivalent

increased. This variation in distribution is shown graphically in figure 2.

There was no comparable relationship between the lead and arsenic content of the tissues, indicating that storage of lead and arsenic as lead arsenate itself probably does not occur in these tissues.

PATHOLOGY

Tissue from the animals killed both after 1 year and after 2 years was submitted to pathological examination. Paraffin sections were made from the liver, spleen, kidneys, heart, pancreas, stomach, duodenum, jejunum, ileum, and large intestine. Sections were routinely stained by Lillie's (*12*) eosin-polychrome methylene blue method. Sections from all of the spleens and a representative number of kidneys were stained by ferrocyanide to demonstrate the presence or absence of iron-bearing pigment. A number of sections, when

indicated, were stained by Lillie's [2] current modification of Gallego's elastic and connective tissue stain. Special microchemical methods described later were employed in studying the changes in the kidneys. An estimate of the degree of involvement of each organ was recorded for each rat in terms of a numerical code in which 0 designated no change from normalcy; minus plus, very slight; plus minus, slight or few; one plus, moderate; two plus, numerous; three plus, marked or many; and four plus, very marked or very many. These findings have been summarized in table 3 in which the average or typical reaction is entered. In every group of rats, of course, there were individual differences in reaction. These differences in response were considered in drawing conclusions from the data entered in the table.

TABLE 3.—*Summary of the principal pathologic findings in rats fed calcium arsenate, lead arsenate, and lead carbonate for periods of 1 and 2 years, respectively* [1]

	Calcium arsenate		Lead arsenate		Lead carbonate		Controls	
	1 year	2 years	1 year	2 years	1 year	2 years	1 year	2 years
Spleen:								
Hemosiderin	++	+++	++	++	±	±	±	0
Myelosis	++	++	+	++	∓	±	++	+++
Follicular phagocytosis	∓	±	∓	±	±	0	0	0
Kidney:								
Swollen cells in convoluted tubules	++	+	++	+	+++	+++	0	0
Oxyphil intranuclear inclusions	0	0	∓	+	+++	++	0	0
Brown pigment in convoluted tubule cells	+++	+	++	+	+++	+++	∓	++
Brown pigment in proximal tubule cells	+++	+	++	+	+++	+++	0	++
Brown pigment in distal tubule cells	++	0	0	∓	++	+	0	0
Casts	±	++	±	+	±	+	0	0

[1] 0, no deviation from normal; ∓ very slight, very few; ±, slight, few; +, moderate; ++, moderately marked, numerous; +++, marked, many; ++++, very marked, very many.

A total of 1,190 histological sections from a representative group of 87 rats was studied.

CALCIUM ARSENATE

Spleen.—The findings of the 1-year experiments were similar in all respects to the findings of the 2-year experiments but were less conspicuous. The splenic corpuscles were small, well defined, and surrounded by fairly large zones of paler staining cells, probably areas of perifollicular anemia. A moderate to a marked splenic myelosis (myeloid hyperplasia) with accompanying megakaryocytes was present in all of the animals. The degree of myelosis paralleled to some extent the amount of hemosiderin present. The cavernous veins were filled with blood, the amount of which varied inversely with the degree of myelosis and perifollicular anemia. Diffuse iron reaction (hemosiderosis) of a few to a considerable number of cells was

[2] Personal communication from Dr. R. D. Lillie.

found in all but 2 of the 14 rats in the 1-year series and in all of the 2-year group (fig. 3). In addition, a few round golden brown granules, some of which reacted for iron, but most of which did not, were present in the pulp. They showed considerable variation in size and were morphologically similar to granules found in the kidneys. These granules were not numerous and occurred more frequently and in greater numbers in the 2-year series. Lymphocytic infiltration of the trabeculae, usually slight to moderately marked in degree, was present in all of the rats. Nuclear fragments were found in the follicles of only 4 animals of the 1-year series but occurred in 9 of the 11 rats fed calcium arsenate for 2 years.

Kidneys.—Pathologic changes, with the exception of casts in the straight collecting tubules, were more conspicuous in the 1-year series than in the 2-year series. The cells in isolated tubules or in groups of convoluted tubules were swollen and contained large, vesicular nuclei. Many contained fairly large basophilic nucleoli but the oxyphil nuclear inclusions, so frequent in the lead carbonate series, were absent. The cytoplasm of the swollen cells was granular, not radially striated, and the cells sometimes occluded the lumina. Round, golden brown particles, variable in size, were found in a large proportion of the cells. They were most numerous in the swollen, convoluted tubule cells but also were present in the apparently normal cells. These particles were found both in the cells and in the lumina of the convoluted tubules. No iron was demonstrated in a random selection of sections. Some cells appeared to be breaking down and discharging the brown granules.

Both the brown pigment and hypertrophied cells were found only in the convoluted tubules and were more frequent and numerous in the proximal convoluted tubules. They were also more marked in the 1-year series, and were often absent in the distal convoluted tubules in the 2-year experiments. Discussion of these particles will be presented later. Congestion of interstitial capillaries and glomeruli was insignificant in both the 1- and 2-year experiments. Hyaline casts, sometimes in great numbers, especially in the 2-year series, were present in the straight collecting tubules and in the ducts of Bellini. Serum was present in an occasional glomerular space in a few of the animals, especially those showing very large numbers of casts.

Liver.—The cytoplasm of the cells was finely granular and generally fairly dense. An occasional and infrequent large nucleus was noted but no oxyphil inclusion bodies in the nuclei were present. Periportal lymphocytic infiltration was usually absent; when present it was slight in degree. No differences were noted in the livers of the animals from the 1-year and the 2-year experiments and in the controls.

No changes of note occurred in the stomach, duodenum, jejunum, ileum, large intestine, pancreas, and heart.

LEAD ARSENATE

The pathologic changes observed in this series of animals resembled the changes resulting from ingestion of calcium arsenate but differed in degree of involvement.

The *spleens* of the 1-year group of animals showed findings similar to those observed in the calcium-arsenate series. The degree of splenic myelosis was slightly less. Hemosiderosis was the same but the other changes were less prominent. In the 2-year series the amount of hemosiderin was less than in the 1-year animals and in the calcium-arsenate-fed rats.

Iron-bearing pigment was present to a large extent in the pulp but was also noted in the perifollicular zone of anemia and in a few of the follicles.

The *kidneys* showed the same changes noted with calcium arsenate but a few intranuclear oxyphil inclusions not present in the calcium-arsenate group were found. These inclusions were more numerous in the 2-year animals. The swollen cells of the convoluted tubules were more numerous and the amount of brown pigment was greater in the 1-year series than in the 2-year series. The position of the brown granules in the cells of the convoluted tubules was the same and they were noted more often in the cells of the distal tubules than in the same region in the calcium-arsenate series. The number of casts was less than observed with calcium arsenate in the 2-year series. Congestion was occasionally noted in the 1- and 2-year groups but appeared to be of no importance.

The other organs showed nothing of note.

LEAD CARBONATE

The pathologic changes in the lead-carbonate group of animals were in general similar to those observed in the animals fed calcium arsenate and lead arsenate.

Hemosiderosis of the *spleen* was much less marked than with calcium arsenate and lead arsenate and was occasionally absent. Follicular phagocytosis was also diminished. Splenic myelosis was less marked than in the controls. Lead carbonate was the only one of the three compounds tested which caused a significant reduction in splenic myelosis.

The *kidneys* showed a marked increase in the number of swollen cells with large vesicular nuclei. Large oxyphil intranuclear inclusions were numerous and conspicuous and occurred in a large number of the swollen cells. The brown granules noted in the other two groups were present. They were more numerous in the proximal convoluted tubules where they were more prominent than in the distal tubules. These particles were noted in the lumina and in the cyto-

FIGURE 3 —Spleen of rat fed calcium arsenate for 2 years treated with ferrocyanide to show amount of distribution of hemosiderin (87 X)

FIGURE 4 —Kidney of rat fed lead carbonate for 2 years Large cell and nuclei with oxyphil intranuclear inclusion body adjacent to cross section of convoluted tubule with brown cytoplasmic granules Other large nuclei and pigment particles are seen in the section (495 X)

plasm of large and normal-sized convoluted tubule cells. The number of casts was less than in the animals fed the other two compounds, but was definitely increased in the 2-year series.

The other organs showed essentially no change.

DISCUSSION OF PATHOLOGY

In the spleen, the most significant findings were the presence of hemosiderin and the behavior of the myeloid (hemopoietic) tissue. Hemosiderosis has been generally accepted by most investigators as signifying blood destruction. Myeloblasts, as Naegeli (*13*) believes, following the idea of the dual origin of the blood cells, give rise to granulocytes, monocytes, and erythrocytes. The presence of myeloid cells, usually in large numbers, has been observed in the spleens of untreated rats in this laboratory. Jaffe (*14*) states that great numbers of a "neutrophilic element," which from his description are evidently myelocytes, are found in the spleens of rats but rarely occur in rabbits and guinea pigs. Hence, it appears that myeloid cells are a usual histologic finding in the spleen of the rat and are associated with blood formation. The term splenic myelosis seems preferable to hyperplasia or metaplasia in describing this erythroleucopoietic activity in rats and is so used throughout this discussion.

Hemosiderosis occurred in the following order of decreasing magnitude in the four groups of animals: Calcium arsenate, lead arsenate, lead carbonate, and the controls. In the control group, only traces were found in a few of the animals. The value of splenic hemosiderosis as an indication of destruction of red blood cells and its use as a pathologic index of the relative toxicity of lead and its compounds has been previously mentioned (*10*). This seems to be borne out further by these experiments. Splenic myelosis was present in the animals fed calcium arsenate, less in those fed lead arsenate, and most in the control animals, but was definitely reduced in the lead-carbonate group. Thus, lead carbonate appears to have less destructive action on the blood than calcium arsenate and lead arsenate as indicated by hemosiderosis in this particular instance, but interferes with blood regeneration as shown by decreased splenic myelosis. This would seem to indicate that lead anemia to some extent may be caused by interference with blood formation.

Nuclear fragments in the splenic follicles, indicative of recent cellular destruction, were not a significant finding in any group of animals.

All three compounds caused well-defined pathologic changes in the kidney. The outstanding finding was the occurrence of large swollen cells in the proximal and to a lesser extent in the distal convoluted tubules. Tubules lined entirely by these large cells occurred singly and in clusters. Sometimes the cells were so large as to occlude the lumina. Their cytoplasm was granular and radial striations were

absent. The nuclei were large, vesicular, and contained a relatively small amount of chromatin. In the lead-carbonate series, a strongly oxyphil body, usually very large, was present in many of the large nuclei and occurred in all of the anmals. In the lead-arsenate series, most of the animals showed only a few of the intranuclear inclusions and they were absent in the calcium-arsenate group and in the controls in both 1- and 2-year series. Blackman (*15*) describes these acidophilic bodies in detail and attributes them to lead poisoning.

Peculiar brown granules of widely varying size were also seen in the cells of the convoluted tubules. They were round and occurred in both swollen and normal-sized cells and were found free in the lumina. They were more frequent in the proximal than in the distal convoluted tubules, and were most numerous in both the 1- and 2-year lead-carbonate series and the 1-year calcium-arsenate groups and less numerous in the 1- and 2-year lead-arsenate-fed animals. A few were observed in the controls, mostly in the 2-year group. The brown particles failed to show the presence of iron with ferrocyanide in all but one of about 20 animals so tested. They were insoluble in concentrated sulfuric acid after 72 hours. They were insoluble in strong ammonia (6 hours). Hydrogen peroxide (2 percent) failed to bleach the particles in 1 hour and hydrogen sulfide produced no color change. The particles showed no birefringence with polarized light. Potassium bichromate caused no change in color in 9 days and showed no reaction for lead. Acid para-amidoazobenzaldehyde, a test for bile salts, gave no reaction. On differentiation with 95 percent alcohol, the particles did not retain basic fuchsin. Thoroughly deparaffined formol-fixed sections on quartz slides failed to fluoresce when viewed with the ultraviolet microscope at 3,650Å, isolated by a monochromator, but this does not wholly eliminate the porphyrins, as insufficient information exists as to the value of lack of fluorescence in fixed tissues. It is entirely possible, according to Lillie (*16*), that the particles are hemosiderin from which the iron has been dissolved.

Hyaline casts were present in the straight collecting tubules and ducts of Bellini in a number of the test animals but were absent in the controls. They were particularly numerous in the 2-year calcium-arsenate group. Congestion of the interstitial capillaries and glomeruli was insignificant and often absent. Interstitial lymphocytic infiltration was demonstrated in only four of the entire number of rats examined.

The livers of all of the animals showed no histologic changes of note. In a few animals, scattered throughout the three series, the presence of a relatively large basophilic nucleolus was noted in some of the nuclei of the liver cells. The hepatic acidophilic inclusions mentioned by Blackman (*15*) were not encountered.

Sections from the heart, pancreas, stomach, duodenum, jejunum, ileum, and large intestine showed nothing of note.

CONCLUSIONS

An investigation of the effect of ingestion of lead arsenate, extending over 2 years, was made on rats in order to determine whether the lead or the arsenic component of the molecule, or whether these components in combination, were chiefly responsible for the toxicity of the substance.

Lead arsenate was compared with calcium arsenate on the one hand and lead carbonate on the other.

Based upon mortality rates over the 2-year period, the order of toxicity of the three substances at equivalent levels of intake was as follows: Calcium arsenate was most toxic, lead arsenate less, and lead carbonate least toxic.

Pathologic studies showed significant changes in the kidney and spleen.

The large hyperregenerative cells with large vesicular nuclei and cytoplasmic brown pigment granules in the renal convoluted tubules were most frequent in rats fed lead carbonate, less with lead arsenate, and least with calcium arsenate. The large oxyphil intranuclear inclusions appeared in the same order in the animals fed lead carbonate and lead arsenate but were absent in the calcium-arsenate group. This seems to indicate that lead is the causative agent for these reactions.

Splenic hemosiderosis, considered indicative of blood destruction, occurred in greater amounts in the rats fed calcium arsenate and lead arsenate than in those fed lead carbonate. Splenic myelosis (erythroleucopoietic activity) was distinctly reduced in the lead-carbonate series but not appreciably diminished in the calcium-arsenate and lead-arsenate series or in the control groups. If splenic hemosiderosis is accepted as a sign of blood destruction and splenic myelosis is accepted as signifying blood formation, it appears that the action of lead carbonate on the spleen in rats may be both hypoplastic and hemolytic while that of the arsenate radical is primarily hemolytic. The degree of both splenic myelosis and hemosiderosis found in the animals fed the three compounds decreased in the following order: Calcium arsenate, lead arsenate, and lead carbonate, which parallels the order of toxicity as determined by the mortality rates.

The distribution of lead and arsenic in the tissues of the 1- and 2-year groups indicates less storage of lead than of arsenic in the soft tissues of animals fed lead arsenate.

The kidney content of arsenic in the calcium-arsenate group was distinctly greater than that of the lead-arsenate group, both in the 1-year and in the 2-year animals.

The concentration of arsenic in the liver of the 1-year calcium-arsenate group was somewhat less than that of the 1-year lead-arsenate group but greater in the 2-year animals.

With reference to the two lead compounds studied, there is a greater degree of deposition of lead in the tissues of the rats given lead carbonate than in those given lead arsenate, both in the 2-year and 1-year groups. This is strikingly apparent in the case of bone-deposited lead where practically twice as much lead was deposited in the bones of the lead-carbonate group as in the lead-arsenate group.

Since bone-deposited lead is a somewhat safer index of absorption than the degree of lead deposition in the softer tissues, it would appear that the arsenate radical either decreases the absorption or increases the excretion of lead.

ACKNOWLEDGMENT

The authors wish to thank Surgeon P. A. Neal and Passed Assistant Surgeon W. C. Dreessen for numerous suggestions, also Junior Scientific Aide F. L. Weaver, Jr., and Assistant Scientific Aide S. W. Jones for analytical and technical assistance, Medical Technician E. C. Thompson and Junior Medical Technician A. S. Gerber for technical assistance in preparing histological sections, and Bacteriological Technician R. D. Reed for the photomicrography.

REFERENCES

(1) McDonnell, C. C., and Graham, J. J.: The decomposition of lead arsenate by water. J. Am. Chem. Soc., **39:** 1912 (1917).

(2) Newcomer, E. J.: Laboratory experiments with arsenicals in the control of the codling moth. J. Agr. Research, **33:** 317 (1926).

(3) Fleming, W. E., Baker, F. E., and Koblitsky, L.: The insecticidal action of acid lead arsenate on the larvae of the Japanese beetle in different types of soil. J. Agr. Research, **53:** 771 (1936).

(4) Pearce, G. W., Norton L. B., and Chapman, R. J.: A chemical method for determining the safeness to foilage of commercial calcium arsenates. Tech. Bull. N. Y. Agr. Expt. Sta., **234:** 2–15 (1935).

(5) Roark, R. C.: Insecticides and fungicides. Chem. Industry, **42:** 636 (1938).

(6) Calvery, H. O.: Chronic effects of ingested lead and arsenic: review and correlation. J. Am. Med. Assoc., **111:** 1722–1729 (1938).

Calvery, H. O., Laug, E. P., and Morris, H. J.: Chronic effects on dogs of feeding diets containing lead acetate, lead arsenate, and arsenic trioxide in varying concentrations. J. Pharm. and Exp. Therap., **64:** 364–387 (1938).

Finner, L. L., and Calvery, H. O.: Pathologic changes in rats and in dogs fed diets containing lead and arsenic compounds; compounds used; lead arsenate, arsenic trioxide, calcium arsenate, and lead acetate. Arch. Path., **27:** 433–446 (1939).

Grant, R. L., Calvery, H. O., Laug, E. P., and Morris, H. J.: Influence of calcium and phosphorus on storage and toxicity of lead and arsenic. J. Pharm. and Exp. Therap., **64:** 446–457 (1938).

Kuhn, H. A.: Toxicity of insecticides. Effect of repeated doses of lead arsenate. J. Pharm. and Exp. Therap., **39:** 246 (1930).

Laug, E. P., and Morris, H. P.: Effect of lead on rats fed diets containing lead arsenate and lead acetate. J. Pharm. and Exp. Therap., **64:** 388–410 (1938).

Lightbody, H. D., and Calvery, H. O.: Variations in arginase concentrations in livers of white rats caused by administration of arsenic and lead. J. Pharm. and Exp. Therap., **64:** 458–464 (1938).

McCulloch, E. C., St. John, J. L., and Groves, K.: Moderate amounts of lead-arsenate-sprayed apples noninjurious to swine. J. Am. Vet. Med. Assoc., **97:** 51–52 (1940).

McCulloch, E. C., and St. John, J. L.: Lead-arsenate poisoning of sheep and cattle. J. Am. Vet. Med. Assoc., **96:** 321–326 (1940).
MacKintosh, P. G.: Clinical manifestations and surgical treatment of lead poisoning in the horse. J. Am. Vet. Med. Assoc., **74:** 193–195 (1929).
St. John, J. L., McCulloch, E. C., Sotola, J., and Todhunter, E. N.: Toxicity to sheep of lead arsenate and lead arsenate spray residues. J. Agr. Research, **60:** 317–329 (1940).
Seddon, J. R., and Ramsay, A. A.: Toxicity of certain arsenic and lead compounds for sheep. N. S. Wales Dept. Agric., Vet. Res. Rpt. No. 6, pt. 3, p. 113 (1933).
Shields, J. B., Mitchell, H. H., and Ruth, W. A.: The relative retention by growing rats of lead ingested in water and in food, and in soluble and insoluble forms. J. Ind. Hyg. and Toxicol., **22:** 199–205 (1940).
Shields, J. B., Mitchell, H. H., and Ruth, W. A.: The effect of apple constituents on the retention by growing rats of lead contained in spray residues. J. Nutrition, **18:** 87 (1939).
von Glahn, W. C., and Flinn, F. B.: The effect of yeast on incidence of cirrhosis produced by lead arsenate. Am. J. Path., **15:** 771–781 (1939).
von Glahn, W. C., Flinn, F. B., and Keim, W. F., Jr.: The effect of certain arsenates on the liver. Arch. Path., **25:** 488–505 (1938).
(*7*) Fairhall, L. T.: The estimation of minute amounts of lead in biological material. J. Indust. Hyg., **4:** 9 (1922).
(*8*) Fischer, H.: Die Metalverbindungen der Diphenylthiocarbazons und ihre Verwendbarkeit für die chemische Analyse. Wiss. Veröffentl. a. d. Siemens-Konzern., **4:** 158 (1925).
(*9*) Assoc. Official Agr. Chemists: Committee on Analysis. Official and Tentative Methods of Analysis, 3rd ed., Washington, 1930.
(*10*) Fairhall, L. T., Sayers, R. R., and Miller, J. W.: The relative toxicity of lead and some of its common compounds. Pub. Health Bull. No. 253. Government Printing Office, 1940.
(*11*) Blumenfeldt, S.: Die Verteilung des Arsens im Körper unter besonderer Berücksichtigung mehrfacher Giftdosen. Deut. Ztschr. f. d. gesamte gericht. Med., **15:** 501 (1930).
(*12*) Lillie, R. D.: Romanowsky staining with buffered solutions. III. Extension of the method to Romanowsky stains in general. Stain Technology, **16:** 1 (1941).
(*13*) Naegeli, O.: Blutkrankheiten und Blutdiagnostik. 5th ed., Berlin, 1931.
(*14*) Jaffe, R.: Anatomie und Pathologie der Spontanerkrankungen der kleinen Laboratoriumstiere. J. Springer, Berlin, 1931.
(*15*) Blackman, S. S.: Intranuclear inclusion bodies in the kidney and liver caused by lead poisoning. Bull. Johns Hopkins Univ. Hosp., **58:** 384–403 (1936).
(*16*) Lillie, R. D.: Experiments on the solubility of hemosiderin in acids and other reagents during and after various fixations. Am. J. Path., **15:** 225–239 (1939).

DEATHS DURING WEEK ENDED JULY 26, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended July 26, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,601	8,855
Average for 3 prior years	7,696	
Total deaths, first 30 weeks of year	261,597	262,759
Deaths per 1,000 population, first 30 weeks of year, annual rate	12.2	12.2
Deaths under 1 year of age	555	546
Average for 3 prior years	510	
Deaths under 1 year of age, first 30 weeks of year	15,762	15,128
Data from industrial insurance companies:		
Policies in force	64,389,697	65,055,294
Number of death claims	9,975	11,718
Death claims per 1,000 policies in force, annual rate	8.1	9.4
Death claims per 1,000 policies, first 30 weeks of year, annual rate	9.9	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 2, 1941

Summary

Although another increase was recorded in the number of cases of poliomyelitis, the rise was less sharp than in the two preceding weeks. For the current week 326 cases were reported (8 percent increase) as compared with 302 for the preceding week (an increase of 23 percent). The 5-year (1936–40) median expectancy is 197. The largest number of cases for the corresponding week of the past 5 years (414) was reported in 1937, in which year 2,485 cases had been reported to August 7, as compared with 1,851 cases to date this year.

The highest incidence continues in the South Atlantic and East South Central States, which reported 200 cases, or 61 percent of the current total, as compared with 70 percent of the total for the preceding week. Larger increases were recorded for the current period in some of the Northern States than were reported last week. The States currently reporting more than 10 cases are as follows, with last week's figures in parentheses: Georgia, 71 (79); Alabama, 49 (58) Florida, 27 (16); Maryland, 14 (3); Pennsylvania, 15 (8); Ohio, 16 (11); Illinois, 13 (4); Tennessee, 13 (24); New York, 12 (11).

As compared with the preceding week slight increases were also reported for diphtheria, meningococcus meningitis, typhoid fever, and whooping cough. Only 6 cases of smallpox were reported—the same as for last week. Five of the current cases occurred in the North Central States.

North Dakota reported 54 cases of encephalitis, South Dakota 19, Minnesota 35, and Colorado 3. Connecticut reported 7 cases of undulant fever, Maryland 2, and South Dakota and North Carolina 1 case each. Of 70 cases of endemic typhus fever, Texas reported 25 cases, Georgia 19, and Alabama 13.

Marmots from San Miguel County, Colorado, have been found plague infected. This is believed to be the first instance of plague infection reported in that State.

The death rate for the current week in 88 large cities is 11.9 per 1,000 population, as compared with 10.6 for the preceding week and with a 3-year (1938–40) average of 10.8.

Telegraphic morbidity reports from State health officers for the week ended August 2, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940	
NEW ENG.												
Maine	0	0	0	------	------	------	53	44	25	0	0	0
New Hampshire	0	0	0	1	------	------	3	0	3	0	0	0
Vermont	0	0	0	------	------	------	48	10	10	0	0	0
Massachusetts	2	2	2	------	------	------	125	315	118	3	0	1
Rhode Island	1	0	0	------	------	------	10	29	7	0	0	0
Connecticut	1	0	1	------	1	------	51	9	14	0	2	0
MID. ATL.												
New York [1]	15	7	19	[2] 1	[2] 4	[2] 2	202	351	261	6	2	7
New Jersey	0	4	3	2	1	1	117	200	73	0	0	0
Pennsylvania	6	5	17	------	------	------	264	151	117	3	3	3
E. NO. CEN.												
Ohio [1]	3	4	6	3	6	3	123	22	77	0	0	0
Indiana [3]	4	5	6	4	2	------	32	10	2	0	1	1
Illinois	16	12	15	------	6	3	50	93	25	2	0	2
Michigan [4]	0	5	7	------	4	------	122	193	68	1	0	1
Wisconsin	1	0	1	5	8	10	188	285	32	0	1	1
W. NO. CEN.												
Minnesota [5]	1	0	2	------	2	1	5	18	18	2	1	0
Iowa	1	1	1	------	------	------	25	30	21	1	3	0
Missouri	5	0	6	2	------	18	23	3	3	2	0	0
North Dakota [5]	1	1	2	2	------	2	14	1	1	0	0	0
South Dakota [5]	4	4	1	------	------	------	0	3	------	0	0	0
Nebraska	0	0	1	------	------	------	2	6	2	0	0	0
Kansas [1]	2	5	2	1	1	1	21	15	7	1	1	1
SO. ATL.												
Delaware [3]	0	0	0	------	------	------	2	1	------	0	0	0
Maryland [3 4]	0	1	4	------	1	1	101	6	13	2	0	0
Dist. of Col.	0	3	3	------	------	------	11	2	5	0	0	0
Virginia	5	21	17	61	15	------	102	43	35	2	0	1
West Virginia [4]	2	3	3	6	2	6	24	6	6	1	1	0
North Carolina [1 3]	7	9	9	------	------	------	63	26	26	0	1	2
South Carolina [1]	1	3	8	61	116	63	63	19	9	0	1	1
Georgia [1]	9	1	16	10	3	------	44	11	------	0	1	2
Florida [1]	2	4	4	23	------	1	25	6	4	0	0	0
E. SO. CEN.												
Kentucky	1	5	4	------	1	1	21	41	5	1	2	2
Tennessee	2	1	4	9	6	6	33	9	7	2	0	1
Alabama [1]	8	9	11	2	5	5	12	30	3	1	0	1
Mississippi [4]	4	2	9	------	------	------	------	------	------	0	2	0
W. SO. CEN.												
Arkansas	2	2	5	2	15	5	32	2	2	0	0	0
Louisiana	0	3	8	1	2	9	2	2	2	0	0	0
Oklahoma	1	2	3	7	9	5	16	1	3	0	0	0
Texas [1]	27	14	21	345	137	53	101	70	34	1	1	2
MOUNTAIN												
Montana	0	6	1	5	------	------	0	17	12	0	1	0
Idaho	0	1	0	------	------	1	0	4	4	0	0	0
Wyoming	5	1	1	3	------	------	2	3	3	0	0	0
Colorado [5]	8	7	7	22	------	------	31	5	9	0	0	0
New Mexico	0	0	2	2	------	------	26	14	6	0	0	0
Arizona	1	1	1	22	14	10	29	13	9	0	0	0
Utah [4]	0	0	0	------	------	------	8	19	12	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	1	1	------	------	------	5	7	16	0	0	0
Oregon	0	1	1	4	------	3	7	13	13	0	0	0
California [1]	15	8	16	38	8	8	111	82	91	0	0	1
Total	164	164	272	644	369	263	2,349	2,246	1,153	31	24	33
31 weeks	7,287	8,535	13,093	598,539	168,338	151,020	827,376	225,925	268,586	1,359	1,118	2,072

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 2, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940		Aug. 2, 1941	Aug. 3, 1940	
NEW ENG.												
Maine	4	1	1	0	2	10	0	0	0	2	7	2
New Hampshire	0	0	0	1	0	0	0	0	0	1	0	0
Vermont	0	0	0	2	1	1	0	0	0	0	1	1
Massachusetts	5	1	1	64	26	31	0	0	0	4	3	2
Rhode Island	1	0	0	2	0	2	0	0	0	0	0	0
Connecticut	6	0	0	4	6	7	0	0	0	2	6	3
MID. ATL.												
New York [1]	12	4	9	80	73	71	0	0	0	16	11	18
New Jersey	5	0	2	37	27	20	0	0	0	4	5	7
Pennsylvania	15	0	1	40	48	72	0	0	0	13	14	21
E. NO. CEN.												
Ohio [1]	16	13	7	49	72	72	0	0	1	17	8	21
Indiana [3]	5	18	1	9	8	19	1	0	0	4	0	6
Illinois	13	7	7	46	59	82	0	8	7	21	20	19
Michigan [4]	8	8	8	44	57	60	2	1	1	4	4	4
Wisconsin	3	0	0	37	28	48	0	5	2	1	0	3
W. NO. CEN.												
Minnesota [5]	3	2	4	10	11	25	0	1	1	0	1	1
Iowa	1	9	3	9	21	21	1	4	4	1	5	5
Missouri	1	9	2	24	5	15	0	1	1	8	10	14
North Dakota [5]	0	0	0	1	8	5	0	0	0	0	0	0
South Dakota [5]	5	3	1	3	4	5	1	3	3	0	0	1
Nebraska	0	1	3	1	3	4	0	0	2	0	4	0
Kansas [1]	0	23	4	6	15	23	0	0	1	6	7	7
SO. ATL.												
Delaware [3]	0	0	0	1	1	0	0	0	0	0	0	0
Maryland [3 4]	14	0	1	23	8	8	0	0	0	8	4	11
Dist. of Col.	0	0	0	2	1	1	0	0	0	0	0	0
Virginia	4	1	3	5	18	9	0	0	0	4	10	19
West Virginia [4]	1	13	1	12	13	13	0	0	0	1	9	10
North Carolina [1 3]	0	1	2	10	19	17	0	0	0	16	10	18
South Carolina [1]	5	0	0	0	2	2	0	0	0	3	19	13
Georgia [1]	71	0	5	10	8	8	0	0	0	13	29	36
Florida [1]	[6] 27	1	1	2	2	3	0	0	0	4	4	4
E. SO. CEN.												
Kentucky	7	6	3	16	17	17	0	0	0	14	8	39
Tennessee	13	1	3	16	8	9	0	4	1	13	12	32
Alabama [1]	49	1	1	14	13	11	0	0	0	7	11	19
Mississippi [4]	9	0	4	5	6	6	0	0	0	16	13	13
W. SO. CEN.												
Arkansas	1	1	2	1	3	3	1	0	0	20	31	31
Louisiana	5	11	0	3	5	5	0	0	0	9	16	16
Oklahoma	0	6	0	4	9	7	0	5	0	1	24	19
Texas [1]	4	7	7	14	8	21	0	0	0	42	37	57
MOUNTAIN												
Montana	0	8	1	3	2	4	0	0	0	1	0	1
Idaho	0	4	1	0	3	3	0	0	1	0	0	1
Wyoming	0	0	0	0	1	3	0	0	0	1	0	1
Colorado [5]	2	0	1	8	3	9	0	1	1	1	0	2
New Mexico	0	1	0	0	3	4	0	0	0	6	5	5
Arizona	0	0	0	1	3	1	0	0	0	1	0	1
Utah [4]	1	1	0	3	2	6	0	0	0	2	2	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	15	1	8	24	18	0	0	0	4	4	2
Oregon	1	3	1	7	6	6	0	1	1	3	2	2
California [1]	8	20	20	40	43	49	0	0	7	7	23	16
Total	[6] 326	197	197	677	705	927	6	34	52	301	379	497
31 weeks	1,851	1,403	1,403	90,780	117,703	135,655	1,173	1,927	7,847	3,813	4,208	6,096

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 2, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, week ended Aug. 2, 1941	Whooping cough, week ended Aug. 3, 1940
NEW ENG.		
Maine	19	84
New Hampshire	16	0
Vermont	11	35
Massachusetts	195	108
Rhode Island	22	4
Connecticut	49	46
MID. ATL.		
New York [1]	235	811
New Jersey	99	76
Pennsylvania	229	437
E. NO. CEN.		
Ohio [1]	343	467
Indiana [3]	13	17
Illinois	164	181
Michigan [4]	317	272
Wisconsin	225	99
W. NO. CEN.		
Minnesota [5]	53	30
Iowa	53	36
Missouri	72	30
North Dakota [5]	30	3
South Dakota [5]	7	6
Nebraska	7	2
Kansas [1]	79	53
SO. ATL.		
Delaware [3]	2	6
Maryland [3 4]	84	141
District of Columbia	20	6
Virginia	50	56
West Virginia [4]	13	27
North Carolina [1 3]	244	111
South Carolina [1]	104	85
SO. ATL.—continued		
Georgia [1]	34	13
Florida [1]	36	2
E. SO. CEN.		
Kentucky	61	71
Tennessee	44	71
Alabama [1]	22	10
Mississippi [4]		
W. SO. CEN.		
Arkansas	7	11
Louisiana	17	7
Oklahoma	30	25
Texas [1]	232	209
MOUNTAIN		
Montana	29	1
Idaho	11	11
Wyoming	6	5
Colorado [5]	123	30
New Mexico	17	34
Arizona	16	17
Utah [4]	29	76
Nevada	0	
PACIFIC		
Washington	110	59
Oregon	29	19
California [1]	335	317
Total	3,952	3,673
31 weeks	139,624	100,575

[1] Typhus fever, week ended Aug. 2, 1941, 70 cases as follows: New York, 2; Ohio, 1; Kansas, 1; North Carolina, 1; South Carolina, 3; Georgia, 19; Florida, 4; Alabama, 13; Texas, 25; California, 1.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended Aug. 2, 1941, 5 cases as follows: Indiana, 1; Delaware, 1; Maryland, 2; North Carolina, 1.
[4] Period ended earlier than Saturday.
[5] Encephalitis, week ended Aug. 2, 1941, 111 cases as follows: Minnesota, 35; North Dakota, 54; South Dakota, 19; Colorado, 3.
[6] Delayed report of 6 cases included.

PLAGUE INFECTION IN CALIFORNIA AND MONTANA

IN FLEAS FROM GROUND SQUIRRELS IN KERN AND SISKIYOU COUNTIES, CALIF.

Under dates of July 24 and 26, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 201 fleas from 10 ground squirrels, *C. beecheyi*, submitted to the laboratory on July 10 from a location 1 mile south and 1 mile east of Keene, Kern County, Calif.; and in 2 pools of fleas from ground squirrels, *C. douglasii*, from

a ranch 8 miles east and 3 miles south of Montague, Siskiyou County, Calif., one a pool of 387 fleas from 8 ground squirrels submitted to the laboratory on July 9, and the other a pool of 290 fleas from 8 ground squirrels submitted on July 11.

IN FLEAS FROM GROUND SQUIRRELS IN BEAVERHEAD COUNTY, MONT.

Under date of July 23, Dr. N. E. Wayson, Medical Officer in Charge, Plague Suppressive Measures, San Francisco, Calif., reported that a pool of 49 fleas from 120 ground squirrels, *C. columbianus*, shot July 8 on a ranch 12 miles west of Wisdom, Beaverhead County, Mont., had been found positive for plague.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 19, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	78	25	11	964	281	334	5	345	51	1,373	--------
Current week [1]	84	23	13	909	200	255	0	316	25	1,448	--------
Maine:											
Portland	0	------	0	0	2	0	0	0	0	3	22
New Hampshire:											
Concord	0	------	0	0	1	1	0	0	0	0	6
Manchester	0	------	0	0	0	1	0	0	0	0	11
Nashua	0	------	0	0	0	0	0	0	0	3	--------
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	0	------	0	0	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	10
Massachusetts:											
Boston	0	------	0	47	12	18	0	14	1	35	213
Fall River	0	------	0	0	1	1	0	1	0	0	20
Springfield	0	------	0	24	0	2	0	0	0	3	25
Worcester	0	------	0	4	4	9	0	0	0	9	45
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	10
Providence	1	------	0	13	0	5	0	1	0	28	50
Connecticut:											
Bridgeport	0	------	0	11	2	0	0	0	0	3	35
Hartford	0	------	0	1	1	3	0	0	0	2	31
New Haven	0	------	0	3	0	8	0	1	0	3	33
New York:											
Buffalo	0	------	1	8	4	7	0	4	0	15	112
New York	10	1	1	89	28	28	0	69	6	142	1,142
Rochester	0	------	0	22	1	1	0	0	0	9	49
Syracuse	0	------	0	17	0	2	0	0	0	20	36
New Jersey:											
Camden	0	------	0	2	2	0	0	0	0	3	23
Newark	0	1	1	20	4	6	0	14	0	19	105
Trenton	0	------	0	4	0	8	0	1	1	0	29
Pennsylvania:											
Philadelphia	0	------	0	14	11	13	0	25	2	54	379
Pittsburgh	1	2	3	80	5	2	0	5	1	43	122
Reading	0	------	0	2	0	0	0	2	0	1	21
Scranton	0	------	--------	17	-------	0	0	-------	0	2	--------
Ohio:											
Cincinnati	0	------	0	0	2	2	0	5	0	11	148
Cleveland	0	------	0	6	1	12	0	5	0	57	166
Columbus	0	------	0	9	0	3	0	3	0	12	81
Toledo	0	------	0	125	2	2	0	4	0	60	77

[1] Figures for South Bend estimated; report not received.

City reports for week ended July 19, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Indiana:											
Anderson	0	------	0	3	0	0	0	0	0	0	2
Fort Wayne	0	------	0	1	1	0	0	1	0	0	21
Indianapolis	1	------	0	8	5	1	0	5	0	4	86
Muncie	0	------	0	0	1	1	0	1	0	0	7
Terre Haute	0	------	0	1	1	0	0	0	0	0	16
Illinois:											
Alton	0	------	0	1	2	0	0	0	0	0	12
Chicago	4	------	1	16	14	30	0	26	0	95	597
Elgin	0	------	0	0	0	0	0	0	0	6	3
Moline	0	------	0	0	0	0	0	0	0	3	10
Springfield	0	------	0	28	0	1	0	0	0	1	20
Michigan:											
Detroit	1	------	0	58	8	34	0	9	1	103	225
Flint	0	------	0	1	4	2	0	0	0	10	23
Grand Rapids	0	------	0	20	1	2	0	0	2	1	32
Wisconsin:											
Kenosha	0	------	0	2	0	0	0	0	0	0	5
Milwaukee	0	------	0	101	1	6	0	2	0	65	74
Racine	0	------	0	33	0	0	0	0	0	3	--------
Superior	0	------	0	2	0	1	0	0	0	23	9
Minnesota:											
Duluth	0	------	0	0	0	0	0	0	0	22	19
Minneapolis	0	------	0	4	1	5	0	0	0	19	84
St. Paul	0	------	0	0	5	1	0	3	0	16	50
Iowa:											
Cedar Rapids	0	------	--------	0	-------	0	0	-------	0	1	--------
Davenport	0	------	--------	3	-------	1	0	-------	0	0	--------
Des Moines	0	------	--------	0	-------	0	0	-------	1	9	28
Sioux City	0	------	--------	1	-------	0	0	-------	0	5	--------
Waterloo	0	------	--------	5	-------	2	0	-------	0	0	--------
Missouri:											
Kansas City	0	------	0	21	1	4	0	2	0	6	86
St. Joseph	0	------	0	0	3	0	0	0	0	1	13
St. Louis	0	------	0	11	4	3	0	5	1	43	168
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	6	9
Grand Forks	0	------	--------	0	-------	0	0	-------	0	0	--------
Minot	1	------	0	2	0	0	0	0	0	0	5
South Dakota:											
Aberdeen	0	------	--------	0	-------	0	0	-------	0	0	--------
Sioux Falls	0	------	--------	0	-------	0	0	-------	0	0	11
Nebraska:											
Lincoln	1	------	--------	5	-------	0	0	-------	0	7	--------
Omaha	0	------	0	2	1	1	0	0	0	2	53
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	5	1
Topeka	0	------	0	0	1	4	0	0	0	32	10
Wichita	0	------	0	0	1	0	0	0	0	2	27
Delaware:											
Wilmington	0	------	0	0	2	0	0	0	0	0	19
Maryland:											
Baltimore	0	1	1	128	3	8	0	16	0	82	179
Cumberland	0	------	0	1	0	0	0	0	1	0	16
Frederick	0	------	0	0	0	0	0	0	0	0	1
District of Columbia:											
Washington	0	------	0	30	4	1	0	17	0	9	130
Virginia:											
Lynchburg	0	------	0	19	0	0	0	1	0	2	10
Norfolk	0	------	0	11	2	0	0	1	0	0	27
Richmond	0	------	0	2	0	0	0	2	0	0	49
Roanoke	0	------	0	2	0	0	0	0	0	5	17
West Virginia:											
Charleston	0	------	0	0	2	0	0	0	0	1	18
Huntington	0	------	--------	0	-------	0	0	-------	0	2	--------
Wheeling	0	------	0	4	0	2	0	0	1	10	18
North Carolina:											
Gastonia	0	------	--------	0	-------	0	0	-------	0	4	--------
Raleigh	0	------	0	0	1	0	0	0	0	23	7
Wilmington	0	------	0	3	1	1	0	0	0	15	8
Winston-Salem	1	------	0	4	1	0	0	1	0	2	13
South Carolina:											
Charleston	0	------	1	2	2	0	0	1	1	3	22
Florence	0	------	0	0	0	0	0	0	0	1	16
Greenville	0	------	0	0	0	0	0	0	0	2	8

City reports for week ended July 19, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Georgia:											
Atlanta	0	3	1	0	4	1	0	6	0	0	79
Brunswick	0	------	0	0	1	0	0	0	0	1	6
Savannah	0	------	0	6	1	1	0	1	0	1	84
Florida:											
Miami	0	------	0	1	2	0	0	2	1	8	82
St. Petersburg	0	------	0	0	0	0	0	0	0	0	16
Tampa	0	------	0	0	2	0	0	1	0	2	27
Kentucky:											
Ashland	1	------	0	8	0	1	0	0	0	2	5
Covington	0	1	0	0	1	1	0	1	0	0	18
Lexington	1	------	0	0	0	0	0	3	0	3	12
Louisville	0	------	0	14	2	8	0	1	1	19	74
Tennessee:											
Knoxville	0	------	0	2	0	1	0	1	1	1	81
Memphis	0	------	0	10	1	0	0	3	0	27	73
Nashville	0	------	0	1	8	1	0	5	0	5	--------
Alabama:											
Birmingham	0	------	0	2	0	0	0	5	1	2	77
Mobile	0	------	0	1	2	1	0	0	0	0	24
Montgomery	0	------	--------	0	-------	1	0	-------	0	2	--------
Arkansas:											
Fort Smith	0	------	--------	0	-------	0	0	-------	0	0	--------
Little Rock	0	------	0	1	4	1	0	5	0	0	31
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	2
New Orleans	8	1	1	1	4	1	0	15	2	43	140
Shreveport	0	------	0	0	2	0	0	1	0	0	28
Oklahoma:											
Oklahoma City	0	------	0	2	2	0	0	3	0	1	31
Tulsa	0	------	0	8	0	0	0	2	0	0	24
Texas:											
Dallas	1	1	1	12	2	0	0	0	1	1	55
Fort Worth	0	------	0	0	1	0	0	0	0	2	38
Galveston	0	------	0	0	3	0	0	2	0	0	19
Houston	0	------	0	8	1	1	0	7	2	1	81
San Antonio	0	------	0	0	1	0	0	3	0	1	63
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	13
Great Falls	0	------	0	1	1	0	0	0	0	5	5
Helena	0	------	0	2	0	1	0	0	0	1	7
Missoula	2	------	0	0	0	0	0	0	0	0	6
Idaho:											
Boise	0	------	0	0	0	0	0	1	0	1	4
Colorado:											
Colorado Springs	0	------	0	2	0	0	0	1	0	6	7
Denver	6	8	0	8	1	0	0	0	0	112	62
Pueblo	0	------	0	8	0	0	0	0	0	3	10
New Mexico:											
Albuquerque	0	------	0	8	2	1	0	0	0	2	21
Arizona:											
Phoenix	0	10	0	7	0	0	0	0	0	9	--------
Utah:											
Salt Lake City	0	------	0	2	2	0	0	0	0	23	84
Washington:											
Seattle	0	------	0	1	3	1	0	1	0	21	97
Spokane	0	------	0	1	2	8	0	0	0	9	37
Tacoma	0	------	0	0	0	1	0	0	0	13	23
Oregon:											
Portland	0	------	0	2	2	1	0	1	0	0	78
Salem	0	1	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	1	9	0	16	3	7	0	9	0	58	306
Sacramento	2	------	0	1	2	2	0	1	0	15	31
San Francisco	0	1	1	4	5	2	0	9	0	24	158

City reports for week ended July 19, 1941—Continued

State and city	Meningitis, meningococcus		Polio-myelitis cases	State and city	Meningitis, meningococcus		Polio-myelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				South Carolina:			
Buffalo	1	0	0	Charleston	0	0	1
New York	1	1	4	Georgia:			
Ohio:				Atlanta	0	0	19
Cleveland	0	0	4	Savannah	0	0	1
Illinois:				Florida:			
Chicago	1	0	1	Tampa	0	0	1
Michigan:				Kentucky:			
Detroit	0	0	4	Louisville	0	0	2
Wisconsin:				Tennessee:			
Madison	0	0	1	Knoxville	0	0	1
Superior	0	0	1	Alabama:			
Maryland:				Birmingham	0	0	15
Baltimore	3	0	8	Montgomery	0	0	1
District of Columbia:				California:			
Washington	0	0	1	San Francisco	1	1	1

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Toledo, 2; Fargo, 12; Minot, 6; Baltimore, 1; Birmingham, 1. Deaths: Fargo, 1; Baltimore, 1; Birmingham, 1.

Pellagra.—Cases: Boston, 1; Baltimore, 1; Savannah, 3; Montgomery, 1.

Typhus fever.—Cases: Miami, 1; Birmingham, 1; Mobile, 3; New Orleans, 1; Dallas, 2; Houston, 1. Deaths: Miami, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 28, 1941.—During the week ended June 28, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	2	2	2	11	2	------	----	3	23
Chickenpox	--------	13	--------	72	184	52	34	84	36	475
Diphtheria	1	12	--------	43	6	4	1	--------	--------	67
Dysentery	--------	--------	--------	9	--------	------	--------	--------	--------	9
Influenza	--------	2	--------	------	4	1	--------	--------	1	8
Measles	1	4	2	97	729	28	27	21	106	1,015
Mumps	2	--------	--------	90	133	14	11	5	2	266
Pneumonia	5	7	--------	------	2	--------	--------	--------	5	19
Poliomyelitis	--------	--------	--------	1	--------	2	------	--------	--------	3
Scarlet fever	5	10	4	44	153	12	8	7	15	258
Trachoma	--------	--------	--------	------	--------	--------	--------	--------	1	1
Tuberculosis	2	11	22	90	56	2	--------	1	--------	184
Typhoid and paratyphoid fever	--------	--------	--------	12	5	--------	--------	1	--------	18
Whooping cough	--------	--------	--------	85	124	1	--------	2	20	232

CANADA

Manitoba—Poliomyelitis.—Information received under date of August 1, 1941, states that 90 new cases of poliomyelitis were reported in the Province of Manitoba for the week ended July 31, making a total of 191 cases, with 8 deaths, during the month of July.

The disease was stated to have spread from the original focus in Winnipeg, where most of the cases have occurred, to rural districts within a radius of 60 miles of the city. A few cases have been reported from remote localities in the Province. In only two instances has more than one member of a family been attacked.

The records so far indicate that 40 percent of the cases have shown muscular weakness or paralysis in some degree, not all of which, however, were severe.

Therapeutic serum is being administered. Donors are not limited to persons who have recently had the disease, but include those who have had the disease at any time, and preferably those who were afflicted with paralysis. The average amount of serum used was

stated to be about 20 cc. per patient, administered within 3 or 4 days from initial onset of symptoms, provided no paralysis is apparent.

The report states that unusually high temperatures are prevailing in Manitoba.

JAMAICA

Communicable diseases—4 weeks ended July 5, 1941.—During the 4 weeks ended July 5, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	5	7	Puerperal fever		2
Dysentery		8	Tuberculosis	19	92
Erysipelas		1	Typhoid fever	4	31
Leprosy		3			

×

Public Health Reports

VOLUME 56 AUGUST 15, 1941 NUMBER 33

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • AUGUST 15, 1941 • No. 33

OBSERVATIONS ON THE USE OF "PHENOL" LARVICIDES FOR MOSQUITO CONTROL

By FREDERICK L. KNOWLES, *Associate Physicist*, WILEY V. PARKER, *Engineering Aide*, and H. A. JOHNSON, *Sanitary Engineer, United States Public Health Service*

For many years commercial larvicides, containing cresylic acid in sulfonated oil, and generally referred to as "phenol" or "phenolic" larvicides, have been reported to be effective in antimosquito work in heavily polluted waters, stagnant pools under buildings, and similar places where oil larvicides in usual quantity have been unsatisfactory. Within the past 3 or 4 years, commercial larvicides of this type have been used in some areas for general control of mosquito larvae. For this work, a compound having a phenol coefficient of 10 to 14 is diluted with water in the ratio of 1 to 30 and applied to the water surface as a fine spray; it is claimed that if the spray is sufficiently fine the larvicide will remain on the surface of the water sufficiently long to kill mosquito larvae. As these commercial larvicides may be diluted with any available water in the field, their use in mosquito control would obviate the transportation of large quantities of material from the headquarters, if effective at the dilution mentioned, as only a small volume of the larvicide need be transported to the location of the water supply.

A number of tests, in both the laboratory and the field, undertaken to demonstrate the value of these larvicides, are described in this report.

EFFICIENCY IN KILLING MOSQUITO LARVAE

Laboratory tests.—The phenol larvicide diluted 1 to 30 with water was tested in the laboratory by applying it in a fine spray from an atomizer to the surface of water in enamel pans in which mosquito larvae had been placed. The rate of application of the larvicide was determined by using exact quantities measured in graduated cylinders

and expressed as gallons per acre; the number of mosquito larvae was determined by actual count. In testing the phenol larvicide, two types of controls were used: (1) larvae in pans similar to those treated with larvicide, allowed to remain completely untreated, and (2) larvae in similar pans treated with a kerosene spray.

TABLE 1.—*Percentage mortality of Anopheles quadrimaculatus 4th stage larvae, untreated and treated with kerosene and various amounts of phenol larvicide. Larvicide applied to pans, each pan containing 30 A. quadrimaculatus 4th stage larvae in tap water*

Time after treatment	Percent mortality				
	Phenol larvicide 1-30			Kerosene	Untreated
	10 gal. per acre, dilution 1-315,000	15 gal. per acre, dilution 1-141,000	25 gal. per acre, dilution 1-156,000	10 gal per acre	
1 hour	Nil	3	20	90	Nil
24 hours	7	10	47	100	Nil

The results of these tests are shown in tables 1 and 2. It appears from table 1 that phenol larvicide (1 to 30) applied at the rate of 25 gallons of the diluted spray per acre killed only 47 percent of anopheline larvae, whereas kerosene applied at the rate of only 10 gallons per acre killed 100 percent of larvae. In table 2 it is shown that phenol larvicide (1 to 30) applied at the rate of 25 gallons per acre killed only 7 percent of culicine larvae, as compared with 99 percent in the case of kerosene. Even when the phenol larvicide (1 to 30) was applied at the rate of 100 gallons per acre, only 42 percent mortality resulted.

TABLE 2.—*Percentage mortality of Culex quinquefasciatus 3d and 4th stage larvae, untreated and treated with kerosene and various amounts of phenol larvicide. Larvicide applied to pans, each pan containing 20 Culex quinquefasciatus 3d and 4th stage larvae in pond water*

Time after treatment	Percent mortality				
	Phenol larvicide 1-30			Kerosene	Untreated
	25 gal. per acre, dilution 1-60,000	50 gal. per acre, dilution 1-30,000	100 gal. per acre, dilution 1-15,000	25 gal. per acre	
1 hour	4	11	36	95	Nil
2 hours	7	16	42	99	Nil

Field tests.—The unusual drought current at the time of the study (May 13–June 6, 1941) limited the selection of areas suitable for testing larvicides.

The general procedure in all field tests was first to sample the area by dipping with a one-pint dipper. The kind and number of larvae

for each dip were recorded and the larvae carefully replaced. The measured area was then treated by spraying with a measured amount of larvicide with an ordinary orchard sprayer. The nozzle was so adjusted that the spray was as fine as could be projected a distance of 6 feet.

Approximately 2 hours after treatment the area was again dipped and the kind and number of larvae recorded for each dip. The dipping determinations are shown in table 3 as the average number of larvae per dip, together with the number of dips.

TABLE 3.—*Comparative action of phenol larvicide and kerosene on mosquito larvae 2 hours after treatment in the field*

Number of test	Type of area	Number of dips made		Phenol larvicide 1-30								Kerosene							
				Application rate, gal. per acre	Size of area treated in square feet	Anophelines		Culicines		Total		Application rate, gal. per acre	Size of area treated in square feet	Anophelines		Culicines		Total	
		Before treatment	After treatment			Average number per dip before treatment	Percent mortality	Average number per dip before treatment	Percent mortality	Average number per dip before treatment	Percent mortality			Average number per dip before treatment	Percent mortality	Average number per dip before treatment	Percent mortality	Average number per dip before treatment	Percent mortality
[1] 1	Ditch	60	60	15	1,500	3.30	28	2.92	60	6.22	43	15	1,500	[3] 1.0	88	[3] 1.3	68	[3] 2.3	77
2	Pond	54	54	35	400	0.96	65	.24	62	1.20	65	---	---	----	----	----	----	----	----
3	Pond	---	----	95	150	----	---	---	[2] 25-50	.	[2] 25-50	35	150	--	----	----	[2] 98	--	[2] 98
4	Lagoon	50	50	20	540	6.20	25	4.50	21	10.7	22	20	540	8.14	63	6.66	59	14.8	61

[1] Ditch was clear of vegetation and covered with a heavy scum.
[2] Estimate.
[3] Only 50 dips.

Effects on vegetation and fish were noted at approximately 2 hours and 24 hours after treatment, respectively.

The area used in field test No. 4 was covered with a heavy mat of water milfoil (*Myriophyllum*). The results for the phenol and kerosene in this area are comparable and show the relative toxicity of the two larvicides, phenol 22 percent mortality and kerosene 61 percent.

Field test No. 3 was performed on a small "pond" of about 150 square feet in area and clear of all vegetation and flotage. No attempt was made to count the larvae, *Culex quinquefasciatus*, in this area because of the large number present. An estimate of the number of larvae present after treatment was only approximate. However, after treatment with the phenol larvicide (1 to 30) the live larvae present were still too numerous to count. Twenty hours after the application of the phenol larvicide and with innumerable larvae still present, kerosene was applied. An hour after the application of kerosene, several portions of the water area were carefully searched for live larvae. These observations form the basis for our estimate of a 98 percent kill for kerosene.

The area in field test No. 2 was another pond which contained a number of minnows, but very few larvae. The choice of this pond was dictated by the presence of minnows; the number of larvae present was so small and the resultant errors of sampling so large that the value given for the percentage kill, 65 percent, is also subject to a large error.

Field test No. 1 was conducted on a small bayou from 3 to 12 feet wide. The area in which the phenol larvicide was applied was clear of vegetation and flotage, while the area used for kerosene was clear of vegetation but was covered with a heavy scum. The percentage killed, 77 percent for kerosene, in this area would probably have been greater if the water surface had been cleared of this scum.

OTHER EFFECTS OF PHENOL LARVICIDES

Action on fish.—Both laboratory and field observations revealed that the phenol larvicide tested had a harmful effect on fish. In table 4 it is shown that the larvicide applied at the rate of 25 gallons per acre to aquarium tanks killed 29 percent of goldfish and 25 percent of "shiners." This same rate of application gave only 47 percent kill of anopheline larvae and 7 percent of culicine larvae (tables 1 and 2, respectively) under laboratory conditions. When the larvicide was applied at the rate of 50 gallons per acre, a comparison of the percentage mortality for fish and for larvae is more striking—16 percent mortality for the culicine larvae as compared to 100 percent mortality for the goldfish.

TABLE 4.—*Percentage mortality of fish in aquaria, untreated and treated with kerosene and various amounts of phenol larvicide*

Type of fish	Number of fish used in each test	Percent mortality 24 hours after treatment					
		Phenol larvicide 1-30				Kerosene	Untreated
		10 gal. per acre, dilution 1-800,000	15 gal per acre, dilution 1-535,000	25 gal. per acre, dilution 1-320,000	50 gal. per acre, dilution 1-160,000	25 gal. per acre	
Goldfish	14	Nil		29	100	Nil	Nil
Shiner minnows	12	33	16	25		Nil	Nil

Also, evidence of damage to fish was obtained in the field. In table 3, test No. 2, it is noted that application of the phenol larvicide at the rate of 35 gallons per acre killed 65 percent of total larvae. When this test was conducted, 10 minnows were recovered from the water after treatment by means of a hand dipper; 4 of these were dead, and the degree to which the other 6 were adversely affected by the larvicide was evident from the ease with which they were picked up in the dipper.

In test No. 3, table 3, larvicide was applied at the rate of 95 gallons to the acre, giving a kill estimated at 25–50 percent of larvae at the end of an hour. Larvae in this pond were far too numerous to count. Two small catfish, each about 4 inches long, were found dead when the pool was inspected 20 hours after application of the larvicide.

Action on vegetation.—No studies designed to determine the effect of the larvicide on vegetation, either gross or microscopic, were undertaken. However, observations made while studying the effects on larvae and fish indicated that slight burning of leaves of a number of plants occurred following the application of the phenol larvicide. Such action has also been reported following the use of kerosene, although in both cases recovery of the affected vegetation appears to occur rapidly.

SUMMARY AND CONCLUSIONS

(1) Under the conditions of these experiments, phenol larvicide (diluted 1 to 30) applied at rates varying from 10 to 95 gallons per acre was less effective than kerosene.

(2) Phenol larvicide, as tested in these studies, was harmful to fish. In the laboratory, the larvicide applied at the rate of 50 gallons per acre killed 100 percent of fish but only 16 percent of larvae.

(3) The phenol larvicide as used in this study, because of its low toxicity for larvae and detrimental effect on fish, does not appear to be a desirable larvicide for general mosquito control.

THE DEPOSITION AND REMOVAL OF LEAD IN THE SOFT TISSUES (LIVER, KIDNEYS, AND SPLEEN) [1]

By LAWRENCE T. FAIRHALL, *Principal Industrial Toxicologist*, and JOHN W. MILLER, *Senior Pathologist, United States Public Health Service*

When lead is absorbed into the body there occurs a general flooding of all the tissues by the lead stream, which the system as a whole tends to correct either by increased excretion or by deposition of the lead in the bone tissue. The removal of lead by the latter method is a more or less temporary means of immobilizing the lead, but it continues, as Minot (*1*, *2*, *3*) has shown, after absorption has ceased, the lead being drawn from the softer tissues. Minot found that in animals killed several months after the last dose of lead by mouth the skeletal lead amounted to 97.0 to 98.5 percent of the total lead in the body.

In spite of the known transitory nature of the lead in the softer tissues, a great deal of data has been accumulated giving the concentration or amounts of lead in these tissues. In these cases information is usually lacking with respect to the time when exposure or

[1] From the Division of Industrial Hygiene, National Institute of Health.

absorption has ceased, except in the case of human autopsy material. This point is important if the significance of the amount of lead in the softer tissues is to be considered in relation to lead poisoning. In recent experiments in this laboratory it appeared that the interval of changing lead content of the soft tissues may not only be a matter of months or even weeks after the ingestion of lead has ceased, but it may be a matter only of days.

Frequently the metal content of a given tissue is related to its pathology and because of the probable variable shift in amount of the deposited material within a relatively short time the following experiments were undertaken to verify this and to find out the extent to which this shift occurred with lead during a reasonable interval.

As a change in the soft tissue content of lead had been noted in similar groups of animals killed within less than a week after lead ingestion had ceased, it was felt that a 14-day rest period would be sufficient to indicate a definite difference. The diet of a colony of 60 white rats was so arranged that each rat ingested approximately 15 mg. of lead carbonate per day (*4*). At the end of 52 days half of the surviving animals were killed. The remaining animals were continued for 14 days on a similar diet from which lead carbonate had been omitted and were then killed.

At death, the livers, kidneys, spleens, and bones were removed for lead analysis, and sufficient blood was taken for a calcium determination. The results thus obtained are given in table 1. The analytical results are based upon wet tissue weights. Since the spleens were very small and a loss was entailed in pathological examination, the amounts of lead determinable were very low and therefore less reliable than the lead content of liver, kidney, or bone.

Inspection of the values thus obtained indicates a distinctly greater quantity of lead in the livers and kidneys immediately following the lead ingestion period as compared with the values obtained following the rest period. The average content in the livers of the former group was 0.020 mg. per liver, or a concentration of 0.032 mg. per 10 gm. of tissue. The average content in the livers of the group following the rest period was 0.011 mg., or 0.016 mg. per 10 gm. of liver. Similarly, the average content in the kidneys of the first group was 0.055 mg., or 0.427 mg. per 10 gm. of kidney, while in the second group the average lead content was 0.031 mg. per kidney, or 0.217 mg. per 10 gm. of tissue. The average lead content in the spleens of the first group was 0.003 mg., as compared with 0.004 mg. in the second group, but, as stated previously, these quantities are so low that comparisons are scarcely reliable. The lead content of the livers and kidneys of the animals following a rest period of 14 days amounted to only 50 percent of that in those animals killed directly at the end of the lead-feeding period.

TABLE 1.—*Group I. Lead content of organs of animals killed at end of experiment*

Rat No.	Weight at death	Liver: Weight, gm.	Liver: Total Pb, mg.	Liver: Pb/10 g., mg.	Kidney: Weight, gm.	Kidney: Total Pb, mg.	Kidney: Pb/10 g., mg.	Spleen: Weight, gm.	Spleen: Total Pb, mg.	Spleen: Pb/10 g., mg.	Bone: Weight, gm.	Bone: Total Pb, mg.	Bone: Pb 10 g., mg.	Blood Ca, mg 100 cc.
344	170	7.55	0.022	0.029	1.13	0.053	0.465	0.56	0.003	0.048	2.10	-----	------	9.7
345	170	7.56	.021	.027	1.48	.050	.337	.82	.004	.048	2.36	0.66	2.24	----
346	144	6.08	.023	.038	1.16	.042	.365	.63	.000	.000	1.80	.32	1.80	10.4
347	143	7.57	.026	.034	1.11	.037	.333	.94	.002	.025	1.91	.75	3.93	11.0
348	150	5.60	.016	.028	1.07	.031	.287	.54	.000	.000	2.52	.41	1.63	10.4
349	160	6.80	.011	.015	1.33	.054	.404	.85	.004	.045	2.90	1.42	4.90	10.2
350	142	5.37	.019	.035	1.06	.040	.377	.72	.003	.035	2.06	------	------	8.9
351	150	6.51	.020	.030	1.45	.058	.400	.75	.003	.037	2.73	.39	1.43	9.7
352	180	7.80	.020	.025	1.30	.042	.320	.86	.000	.000	3.00	1.47	4.90	10.6
353	185	6.94	.019	.027	1.37	.081	.591	.72	.000	.000	3.40	1.49	4.38	9.7
354	165	5.07	.017	.033	1.20	.051	.421	.82	.005	.058	2.61	------	------	12.5
355	170	5.65	.019	.034	1.18	.056	.476	.76	.003	.035	2.77	1.02	3.50	8.6
356	176	7.41	.019	.032	1.44	.084	.583	.76	.003	.035	2.15	.96	4.46	8.2
357	168	6.68	.023	.034	1.34	.042	.312	1.20	.003	.024	2.76	.37	1.34	9.7
358	180	6.72	.020	.029	1.32	.049	.373	.79	.003	.038	3.61	------	------	9.9
359	172	4.95	.020	.041	1.26	.050	.400	.80	.004	.050	2.19	.57	2.60	9.9
360	144	5.27	.019	.036	1.16	.034	.294	.88	.005	.058	2.40	1.22	5.08	9.9
361	165	5.96	.026	.043	1.25	.057	.454	.90	.002	.025	3.00	------	------	10.4
362	133	5.04	.020	.040	1.07	.030	.277	.87	.003	.031	2.59	------	------	11.7
363	135	5.04	.025	.050	1 07	.064	.600	.89	.000	.000	3.02	1.34	4.44	9.7
364	163	5 41	.015	.028	1.27	.052	.411	.93	.008	.087	1.97	.68	3.45	10.2
365	160	8.50	.027	.032	2.08	.085	.411	1.41	.005	.032	3.08	1.67	5.42	8.9
366	150	7.40	.016	.022	1.25	.069	.555	.64	.003	.051	3.48	.90	2.59	9.9
367	150	7.21	.021	.029	1.30	.065	.500	.76	.005	.066	2.75	.53	1.93	10.2
368	160	5.26	.017	.032	1.26	.091	.720	.65	.003	.050	3.00	.80	2.67	9.7
Average	------	------	.020	.032	------	.055	.427	------	(.003)	(.035)	------	.93	3.30	10.0

TABLE 1.—*Group II. Lead content of organs of animals after 14-day lead-free diet*

Rat No.	Weight at death	Liver: Weight, gm.	Liver: Total Pb, mg.	Liver: Pb/10 g., mg.	Kidney: Weight, gm.	Kidney: Total Pb, mg.	Kidney: Pb/10 g., mg.	Spleen: Weight, gm.	Spleen: Total Pb, mg.	Spleen: Pb/10 g., mg.	Bone: Weight, gm.	Bone: Total Pb, mg.	Bone: Pb/10 g., mg.	Blood Ca, mg/100 cc.
369	200	7.08	0.010	0.014	1.61	0.049	0.304	0.71	0.002	0.035	4.05	1.55	3.83	11.0
370	200	6.00	.011	.018	1.32	.031	.233	.81	.004	.048	3.02	1.17	3.79	10.8
371	180	5.98	.018	.030	1.50	.019	.125	.66	.003	.052	3.22	1.21	3.76	12.5
372	180	7.42	.012	.016	1.30	.046	.350	.67	.003	.040	3.09	1.17	3.79	9.7
373	210	5.37	.000	.000	1.18	------	------	.90	.002	.027	3.07	1.18	3.85	10.1
374	210	6.21	.004	.006	1.18	------	------	.65	.000	.000	4.12	------	------	10.8
375	157	6.00	.007	.011	1.36	.021	.156	.53	.001	.025	2.65	.53	2.00	13.6
376	160	6.00	.002	.004	1.30	.026	.200	.59	.005	.088	2.75	.87	3.22	10.8
377	250	8.20	.034	.042	1.32	.020	.154	1.00	.000	.000	2.82	1.13	4.01	10.8
378	170	6.42	.003	.005	1.44	.032	.223	.84	.003	.040	3.26	------	------	11.2
379	160	6.17	.004	.007	1.36	.035	.254	.80	.001	.016	3.10	1.39	4.49	11.7
380	190	7.58	.014	.019	1.32	.025	.190	.87	.007	.080	3.13	1.12	3.58	10.8
381	175	7.87	.009	.011	1.22	.050	.408	.77	.002	.026	2.80	1.36	4.86	10.8
382	165	7.06	.009	.013	1.00	.011	.105	.68	.004	.058	3.02	.80	2.65	11.9
383	165	7.42	.013	.017	1.17	.017	.149	.67	.001	.017	3.05	1.00	3.28	10.8
384	194	7.52	.005	.007	1.64	.027	.167	.90	.015	.166	3.45	1.22	3.54	11.9
385	160	6.00	.008	.014	1.33	.044	.333	.68	.000	.000	------	------	------	10.8
386	150	5.32	.018	.033	1.08	.020	.187	.53	.003	.050	2.55	.53	2.08	9.9
387	165	4.95	.010	.020	1.41	.038	.267	.85	.004	.046	3.00	1.07	3.57	13.2
388	170	6.25	.018	.029	1.41	.025	.178	.78	.003	.036	4.34	------	------	11.7
389	190	7.04	.011	.015	1.87	.051	.271	.87	.005	.054	4.61	1.55	3.36	12.5
390	190	7.52	.009	.012	1.48	.053	.357	.98	.007	.074	3.72	1.78	4.79	11.0
391	200	7.16	.008	.011	1.72	.036	.212	1.45	.007	.045	4.35	------	------	12.1
392	165	6.16	.015	.024	1.42	.021	.150	.71	.001	.015	2.80	.94	3.36	12.5
393	162	5.50	.008	.015	1.40	.016	.113	.85	------	------	3.56	1.21	3.40	10.8
394	185	6.40	.015	.023	1.49	.046	.308	.92	.009	.103	3.66	1.37	3.74	11.0
395	185	5.50	.014	.025	1.81	.033	.180	.88	.006	.071	2.11	1.39	6.60	12.1
396	201	5.40	.006	.012	1.24	.021	.170	.77	.008	.098	2.95	.69	2.34	12.1
Average	------	------	.011	.016	------	.031	.217	------	(.004)	(.049)	------	1.14	3.65	11.4

In contrast with the lead content of the softer tissues, the bones show a slight increase in lead content in the second group, although these animals received no more lead than the first group and furthermore had an opportunity of excreting part of the lead during the 14-day rest period. The average amount of lead present in the bones of the animals of the first group was 0.93 mg. per animal, or 3.30 mg. per 10 gm. of bone tissue, while that of the second group was 1.14 mg. per animal, or 3.65 mg. per 10 gm. of bone tissue. Thus, there was a slight but unmistakable increase in bone lead which must have occurred at the expense of the lead contained in the softer tissues (fig. 1).

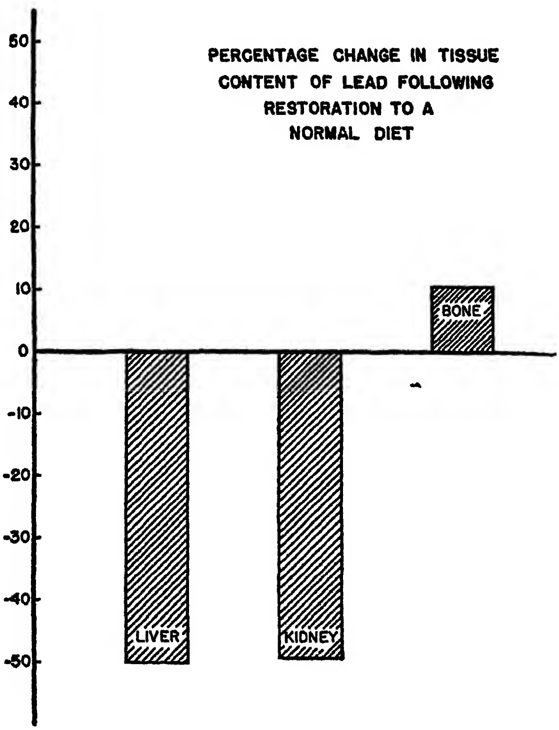


FIGURE 1.

The blood calcium values of the two groups show individual variations about the normal figure. However, in common with other values obtained in lead-poisoned animals, there appears to be a slight rise in the average blood calcium value on return to a normal diet. The average blood calcium value of the first group was 10.0 mg. per 100 cc. as compared with 11.4 mg. following the rest period. Further experimental work is in progress with respect to the possible effect of lead absorption upon blood calcium.

PATHOLOGY

Paraffin sections were made from the liver, kidneys, spleen, pancreas, heart, stomach, duodenum, jejunum, ileum, large intestine, and mesenteric lymph nodes and were routinely stained by Lillie's eosin-polychrome methylene blue method (*5*). Sections from all of the spleens and a representative number of kidneys were treated with acidulated ferrocyanide to demonstrate the presence or absence of iron-bearing pigment. A random selection of kidney sections was stained with hematoxylin and eosin as a check on the eosin-methylene blue stain for the detection of oxyphil intranuclear inclusions. A total of 1,000 sections from 53 rats was studied.

Kidneys.—Sections from the kidneys of 22 rats killed immediately after the 6-week feeding period were available for study. Enlarged cells, with large vesicular nuclei and no radial striations, were observed in the proximal convoluted tubules of the 22 animals and in both the proximal and distal convoluted tubules in 17 rats. Round, brown, cytoplasmic pigment granules were noted in the swollen tubular cells of only 3 rats, and traces of minute, brown pigment particles were present in the same region in 6 other animals.

Neither the brown granules nor the pigment particles reacted to a test for iron. Small interstitial collections of lymphocytes were noted in 9 rats. In two instances they were accompanied by casts in the straight collecting tubules and by a few small areas of tubular cells with basophilic cytoplasm, indicative of very early retrograde change. Lymphocytes, isolated or in very small foci, were also observed in the renal interstitial tissue in 6 animals. The glomerular tufts and interstitial capillaries were not congested.

Swollen convoluted tubule cells were much less evident in the kidneys of 24 rats fed lead carbonate for 6 weeks and returned to a normal diet for 2 weeks than they were in the preceding series. In the preceding series the typical finding was a three plus or marked degree of prevalence of swollen convoluted tubule cells; in this series the typical finding was a one plus degree of prevalence. As before, this phenomenon was principally localized in the proximal tubules. It was present in the distal tubules of all but 9 rats. Small numbers of brown pigment particles were almost invariably present in a few swollen cells in the proximal convoluted tubules. This was a more regular finding in this series than in the preceding series.

A few oxyphil intranuclear inclusion bodies were present in the swollen cells of the proximal convoluted tubules in only one animal. A few lymphocytes were found in the interstitial tissue of the kidney in one rat. Casts were absent in all of the animals. Two of the rats showed a slight congestion of the capillaries but this appeared to be of no significance.

Spleen.—The splenic corpuscles were generally large and well defined and were surrounded by fairly large zones of pale-staining cells. The cavernous veins were usually filled with blood. The degree of relative perifollicular anemia varied inversely with the amount of blood in the cavernous veins. Splenic myelosis with accompanying megakaryocytes was present in a degree approximating that found in normal rats. The marked decrease in number of myeloid cells observed in rats fed lead carbonate for 1 and 2 years (*4*) was not noted in these 6-week feeding experiments. Diffuse iron reaction of cells of the pulp, however, was similar in degree to that found in animals fed for longer periods. A small number of brown pigmented particles which did not react for iron were also present. Lymphocytic infiltration of the muscular trabeculae was slight to moderately marked and occurred in all of the animals. Nuclear fragments were found in the follicles in 20 of the 24 animals examined.

In the rats allowed the normal diet for 2 weeks following 6 weeks of lead ingestion the splenic corpuscles were usually fairly small and well defined with a surrounding zone of paler-staining cells. This zone of relative anemia and the amount of blood in the cavernous veins were identical in degree with those found in the animals examined immediately after the lead ingestion period. The amount of splenic myelosis and the number of megakaryocytes were somewhat reduced both in degree and in the number of animals in which they were found. Myeloid hyperplasia, generally present in rats, was absent in 2 and very scant in 4 of the animals of this series. It was not as prominently decreased as was noted in rats fed lead carbonate for 1 and 2 years.

The amount of iron-bearing pigment in the pulp was likewise somewhat diminished in degree and was absent or very scant in 8 of the 24 rats examined. Follicular phagocytosis, indicated by nuclear fragments in the follicles, was absent in 8 animals and was decreased in amount to half that noted in the animals killed immediately after feeding. Lymphocytic infiltration of the trabeculae was essentially the same as observed in the animals examined immediately after the lead feeding period.

Liver.—The cytoplasm of the liver cells was finely granular and usually fairly dense. The nuclei showed no unusual variation in size and no oxyphil inclusions were noted. The histological picture was essentially the same following return to the normal diet.

Lungs.—Subacute bronchopneumonia, in one case with bronchial epithelium proliferation, occurred in 4 of 23 rats examined in the first series and in 4 of 28 rats examined in the second group. In 2 others of this latter group the larger bronchi were filled with polymorphonuclear leucocytes, granular debris, and nuclear remains. As in the first group of animals these changes appeared to be unrelated to the lead unless they might be interpreted as an indication of general debility.

The heart, pancreas, stomach, duodenum, jejunum, ileum, large intestine, and mesenteric lymph nodes showed no changes of note.

DISCUSSION

The most significant change observed in the kidney was the presence of swollen cells, with large vesicular nuclei and granular cytoplasm, in the convoluted tubules. They occurred in the proximal convoluted tubules in all of the animals but were less numerous and frequently absent in the distal convoluted tubules in both series of tests. These cells were noted in isolated tubules or in groups of tubules. The number of these cells was appreciably reduced in the animals returned to a normal diet. The oxyphil intranuclear inclusions described by Blackman (*6*) and consistently found in the nuclei of rats fed lead carbonate for 1 and 2 years (*4*) were not present except in one animal which had been returned to a normal diet for 2 weeks. In this instance they were few in number. Brown pigment granules were found in the swollen cells of 3 rats and traces of brown pigment in 6 others studied at the end of the 2-week lead-ingestion period. Traces of this pigment were found in 23 of the 24 rats following return to a normal diet for 2 weeks. Like the swollen cells, the pigment occurred most frequently in the proximal convoluted tubules.

It is interesting to note that the proximal convoluted tubule cells show the most change as indicated by the hyper-regenerative cells and the cytoplasmic brown pigment. Marshall and Grafflin (*7*) have shown that the proximal convoluted segment of the renal tubule of the glomerular fish, sculpin, can both secrete and reabsorb. This would suggest that the cells of the proximal convoluted tubules show the greatest damage because of their greater selective exposure. In a previous study (*4*) it was suggested that lead has a damaging action on the kidney and these findings tend to confirm those experiments. The significant reduction in the pathological findings, both in degree and in number of animals affected, following return to a normal diet, seems to indicate that the toxic effects on the kidney, with due consideration to amount and duration of exposure, are susceptible of repair after the intake of lead has ceased. This is in keeping with Beintker's (*8*) opinion that "temporary degenerative changes" occur at the beginning of lead intoxication.

Hemosiderin was present in the spleens of all of the animals examined immediately after the lead-ingestion period. It was slight to moderately marked in degree. Hemosiderosis was essentially of the same degree as that found in animals fed lead carbonate for 1 and 2 years. In the animals examined 2 weeks after cessation of the lead diet, hemosiderin was absent in 2 and only minute traces were found in 6 rats. The average degree was also about one-third less than that

found in the animals killed at the end of the lead-feeding period. Thus it appears that blood destruction in the spleen is a relatively early finding and that it tends to diminish when lead is withheld from the diet.

Splenic myelosis or erythroleucopoietic activity, on the other hand, did not vary appreciably from that usually found in normal rats. It

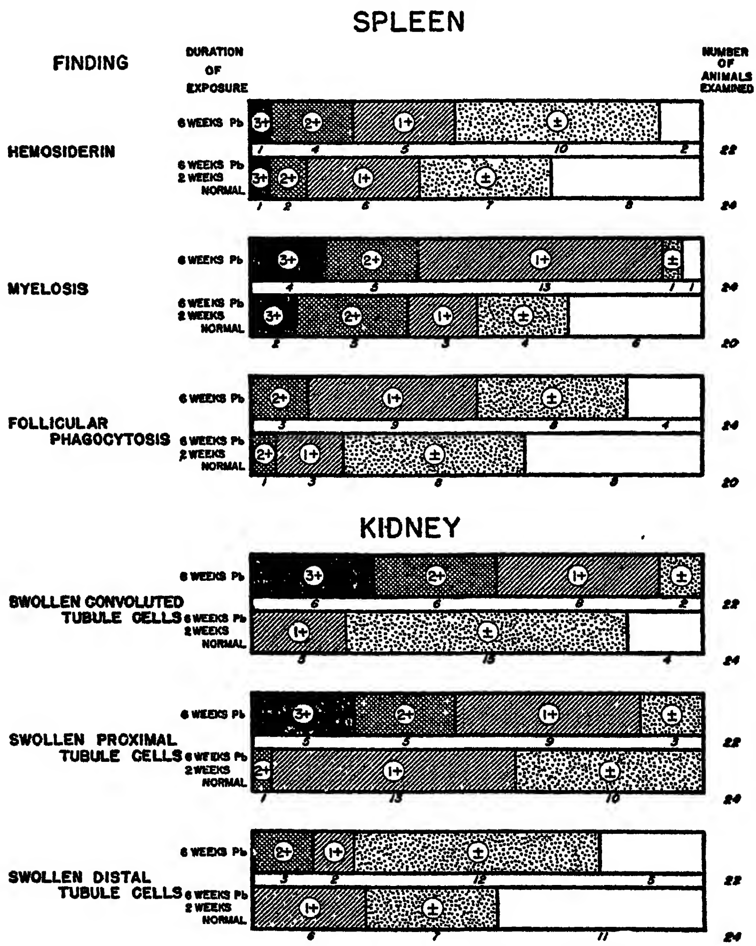


FIGURE 2.—Number and percentage of experimental animals found to have specified amounts of pathologi changes. Percentage of animals with specified reaction: 3 +, marked; 2 +, moderately marked; 1 + moderate; ±, slight; blank, no deviation from normal or very slight amount.

was, however, slightly reduced in the animals examined 2 weeks after return to normal diet. The marked decrease of splenic myelosis seen in rats fed lead carbonate for 1 and 2 years was not present in those animals used in the 6-week feeding experiments. Seiffert and Arnold (9) have observed an increased destruction of blood cells in the spleen, particularly the erythroblasts. Such a destruction of blood would

not only account for the presence of the hemosiderin but also would suggest that the decrease in myeloid cells, prominent in the 1- and 2-year experiments, is due to the destruction of these young forms. Thus, it appears that significant interference with blood formation in the spleen takes place some time after 6 weeks and before 1 year. Nuclear fragments in the follicles were frequently found in the animals examined at the end of the lead carbonate feeding period. Their occurrence, both as to number of animals involved and average degree, was appreciably reduced after a return to normal diet for 2 weeks. Recent cell destruction, as indicated by this follicular phagocytosis, also appears to regress when the rat is returned to normal diet. Other changes in the spleen, such as the perifollicular zones of anemia and the amount of blood in the cavernous veins, seem to be of minor importance.

Changes in the other organs examined were not significant.

It appears from these pathological findings that injury produced by lead in the kidney and spleen of the rat occurs relatively early, is of a temporary nature, and is subject to repair (fig. 2).

CONCLUSIONS

It has been shown that lead deposited in the softer tissues in rats fed approximately 15 mg. of lead carbonate a day for 6 weeks is transitory in nature and may be diminished by 50 percent within 2 weeks merely by restoration to a normal diet. Coincidently there is a slight rise in the lead content of the bone tissue. A slight depression in blood calcium was noted in animals fed the lead diet as compared with those restored to the normal diet.

The ingestion by rats of 15 mg. of lead carbonate per day causes rather severe injury to the cells of the renal convoluted tubules, particularly those of the proximal group, in 6 weeks. This damage is markedly reduced following return to a normal diet for 2 weeks, and appears to be temporary in nature. Significant pathologic changes in the spleen are reduced to some extent after the leaded diet is withdrawn, but the approach to normal is not as marked as in the kidney.

The reduction of lead in the soft tissues observed chemically parallels the repair of injury produced by the lead.

The chemical and pathologic changes associated with the softer tissues of rats following the ingestion of lead carbonate in the quantity used in this study would appear to be of a transient nature.

ACKNOWLEDGMENT

The authors wish to thank Assistant Scientific Aides F. L. Weaver and N. E. Sharpless for technical and analytical assistance, and Medical Technician E. C. Thompson and Junior Medical Technician A. S. Gerber for technical assistance in preparing histological sections.

REFERENCES

(1) Minot, A. S.: The distribution of lead in the organism after absorption by the gastro-intestinal tract. J. Indust. Hyg., 6: 125 (1924).
(2) Minot, A. S.: The distribution of lead in the organism after absorption by the lungs and subcutaneous tissue. J. Indust. Hyg., 6: 137 (1924).
(3) Minot, A. S , and Aub, J. C.: The distribution of lead in the human organism. J. Indust. Hyg., 6: 149 (1924).
(4) Fairhall, L. T., and Miller, J. W.: A study of the relative toxicity of the molecular components of lead arsenate. Pub. Health Rep., 56: 1610 (1941).
(5) Lillie, R. D.: Romanowsky staining with buffered solutions. III. Extension of the method to Romanowsky stains in general. Stain Technology. In press
(6) Blackman, S. S : Intranuclear inclusion bodies in the kidney and liver caused by lead poisoning. Bull. Johns Hopkins Hosp., 58: 384–398 (1936).
(7) Marshall, E. K., and Grafflin, A. L.: The function of the proximal convoluted segment of the renal tubule. J. Cellul. and Compar. Physiol., 1: 161–176 (1932).
(8) Beintker: Nierenreizung bei frischer Bleivergiftung. Med. Welt, 3: 1292 (1929).
(9) Seiffert, G., and Arnold, A.: Zellveranderungen im Knockenmark, Blut und Milz bei experimenteller Bleivergiftung. Arch. f. Hyg., 99: 272–282 (1928).

WEIL'S DISEASE [1]

A REPORT OF 51 CASES OCCURRING IN PUERTO RICO AND THE UNITED STATES

By Carl L. Larson, *Assistant Surgeon, United States Public Health Service*

Weil's disease has been commonly reported in Europe and Asia, but there are relatively few reports in the literature concerning the disease in this country.

The National Institute of Health from time to time receives specimens from various parts of the country for examination as an aid in the diagnosis of Weil's disease. In many cases physicians also submit clinical data where the diagnosis of Weil's disease is confirmed. The material presented in this paper and based upon this type of data indicates that leptospirosis is by no means a rare disease in this country and that the infrequency with which it is reported is due either to failure to recognize the disease, or to infrequent reporting of the condition.

It is not the purpose of this paper to discuss the clinical aspects of leptospirosis since this belongs in the province of the physician who treats the patient. It is to be hoped that these physicians will describe their cases in adequate clinical notes in order to further recognition of the disease. With the same objective of stimulating interest in this condition, it is proposed in this paper to summarize briefly the American literature to date and to present additional cases diagnosed with the aid of tests performed in this laboratory.

[1] From the Division of Infectious Diseases, National Institute of Health.

In 1905 Stimson (*1*) observed an organism, which he called *Spirochaeta interrogans*, in the tissue of a patient dying during an outbreak of yellow fever in New Orleans. This is probably the first instance in which Weil's disease was encountered in this country (*2, 3*), although it was then not recognized as such. Wadsworth et al. (*4*) reported a case in a laboratory worker in 1922. Following this a number of other cases were reported (*5, 6, 7, 8, 9, 10, 11*), and by 1935 Jeghers, Houghton, and Foley (*12*) were able to add the 11th case to the American literature, exclusive of the one noted by Stimson.

In considering the incidence of Weil's disease in this country it might be well to separate the proved cases from those merely alluded to in the literature, and from those in which adequate laboratory data were not obtained. Thus, 10 of the cases cited above are proved, while 2 others (*6, 11*) are not fully confirmed. It is difficult to evaluate the 7 cases reported by Gaines and Johnson (*13*) and there is little data upon which to form conclusions concerning reports from Texas (*14*) and Rhode Island (*15*).

Molner and Meyer (*16*) state that 7 cases of Weil's disease occurred in Detroit, and Meyer et al. (*17*) have evidence concerning at least 11 cases in California. Syverton, Stiles, and Berry (*18*) call attention to a case in Rochester, N. Y., and Goldberg and Davens (*19*) refer to another in Baltimore, Md. These seem to be founded on adequate evidence, but further description is desirable.

The 5 instances of leptospirosis cited by Mulholland (*20*), Martmer (*21*), Glotzer (*22*), Elton (*23*), and Haschec and Tobey (*24*) are fully described and based on sufficient laboratory evidence to establish their identity. In addition, 12 other cases which have been reported recently fulfill all the requirements necessary for their acceptance as proved cases of Weil's disease (*19, 25, 26, 27, 28*). It would appear that there are at least 27 fully described cases and 20 presumptive cases of Weil's disease reported in the American literature at the present time.

Most of these cases have occurred among adult males, but 3 children and 2 adult females are included in the group of 47. In most instances the occupation of the individual accounted for sufficient exposure to infection. One case occurred in a laboratory worker and a number of cases have been traced to swimming in water to which wild rats have easy access. Cooks, gardeners, meat-handlers, dairymen, veterinarians, poultry dressers, quarry workers, sewer workers, and fish cutters have been involved. Geographically the cases are widespread, occurring in 11 States and the District of Columbia (table 1).

TABLE 1.—*Geographic distribution of cases of Weil's disease*

State or area	Cases previously reported		Cases not previously reported			Total
	Proved	Presumptive	Icteric	Anicteric	No clinical data	
Alabama			10	2		12
California	1 (*11*)	11 (*17*)	1			13
Connecticut	1 (*25*)		1		1	3
District of Columbia	1 (*9*)			1		2
Georgia			1			1
Louisiana	1 (*1*)					1
Maryland	1 (*19*)	1 (*19*)	5	1		8
Massachusetts	1 (*12*)		4			5
Michigan	1 (*21*)	7 (*16*)			5	13
New Jersey	1 (*24*)		1		1	3
New York	5 (*4, 5, 7, 22*)	1 (*18*)				6
Ohio	8 (*27, 28*)		1			9
Pennsylvania	4 (*6, 8, 27*)		3			7
Virginia	2 (*10, 20*)		2	3		7
Wisconsin			3			3
Puerto Rico			2		3	5
Total	27	20	34	7	10	98

NOTE.—Figures in parentheses refer to articles in bibliography in which cases were reported.

DATA ON NEW CASES OF WEIL'S DISEASE

The data presented in this paper include 51 cases of Weil's disease previously unreported from the United States and Puerto Rico. Among them are 33 cases having a more or less classical picture of the condition. One additional patient from Alabama was jaundiced about 2 years prior to serological examination and was not hospitalized, although he was unable to work for a month after onset of illness. The data also contain material concerning 7 individuals possessing antibodies against *Leptospira icterohaemorrhagiae* who had never had an illness in which jaundice was an apparent symptom. These were observed during the course of routine serological examinations of groups considered to be exposed to danger of infection. Agglutination and mouse protection tests (*29*) have been used to identify these cases. In addition, agglutination tests have revealed agglutinins in diagnostic titers against this organism in 10 human serums derived from Michigan, New Jersey, Puerto Rico, and Connecticut. No clinical material has been made available in this group of cases. The cases are summarized in table 2.

The geographic distribution of the cases are shown in table 1, together with the distribution of previously reported cases. Thus, 98 cases of Weil's disease have been observed in Puerto Rico and in 14 States and the District of Columbia in the United States. Alabama,

Georgia, Wisconsin, and Puerto Rico have been added to the area from which cases had previously been studied. It is a matter of singular interest that in any given locality the reporting of cases increases with the discovery of a single case. In Wisconsin 2 cases were reported soon after the diagnosis had been established in one patient. Four cases were recognized in Puerto Rico following the identification of the original case. It is difficult to believe that Weil's disease is present only in certain localized areas when conditions necessary for its occurrence in human beings are so widespread. From experience in the various areas it would appear that the spotty distribution of cases is probably due to failure to recognize the disease.

The distribution according to sex of the cases in this series is essentially the same as given in previous reports. Thirty-nine of the patients were males and 2 were females. One frank infection was noted in a colored female between 50 and 60 years of age and an inapparent infection occurred in a female aged 22 years. There were 29 cases in white and 11 in colored individuals. The patients ranged from 18 to 58 years of age, with an average of 33.9 years.

It has been stated (*27*) that the majority of cases reported in this country occurred during the summer months. In our series 18.5 percent of the cases occurred from December through February, 22.2 percent from March through May, 40.7 percent from June through August, and 18.5 percent from September through November.

There are no unusual features about the occupations of the individuals concerned in this report. Among the anicteric or inapparent cases were a waitress, a carpenter, a market employee, 2 slaughterhouse employees, and 2 coal miners, while among the cases with typical Weil's disease were sewer workers, merchants, coal miners, a barber, a plumber, a seaman, a farmer, fishcutters, poultry dressers, a bricklayer, and slaughterhouse workers. Two patients had handled rats prior to the onset of illness.

SUMMARY

A series of 51 previously unreported cases of Weil's disease occurring in Puerto Rico and the United States are discussed. Thirty-three of these are based on adequate clinical and laboratory data and 7 upon laboratory data alone. Another group of 7 anicteric and inapparent cases is also included.

402839°—41——2

TABLE 2.—*Clinical data concerning previously unreported*

Number	Name	Age	Sex	Color	Location	Occupation	Date of onset	Type of onset
1	JC	35	M	W	Roxbury, Mass.	Storekeeper	June 14, 1940	Sudden
2	TH	23	M	W	Atlanta, Ga	Picked up rat	July 25, 1940	do
3	SB	23	M	W	Cambridge, Mass	Slaughterhouse worker.	Feb. 3, 1941	do
4	MT	46	M	W	Los Angeles, Calif	Plumber		
5	CL	47	M	W	New Britain, Conn	Merchant		
6	CS	27	M	W	Milwaukee, Wis	Slaughterhouse worker.		
7		48	M	W	do	Sewer worker		Sudden
8	CB	51	M	W	do	do	May 27, 1939	
9	EW	30	M	W	Secaucus, N. J	Slaughterhouse worker.	1941	Sudden
10	RT	48	M	W	Chelsea, Mass	Fish cutter	Jan. 4, 1941	
11	JL	40	M	W	do	do	Sept. 16, 1940	
12	GL		M	W	Cincinnati, Ohio	Unemployed	June 1940	
13	GK	18	M	W	Philadelphia, Pa	Unemployed, picked up rat Aug. 12, 1940.	Aug. 17, 1940	
14	JW	18	M	W	do			
15	FDA	28	M	W	do	Barber	June 12, 1940	
16	JA	41	M	W	Puerto Rico	Seaman	Nov. 30, 1940	
17	EDR	39	M	W	do	Farmer	Nov. 4, 1940	Sudden
18	GM	25	M	C	Richmond, Va	Poultry picker	Dec. 1, 1940	
19	RM		M	W	do	Brick layer		Sudden
20	RP	28	M	W	Birmingham, Ala	Coal miner	Mar. 14, 1938	do
21	LT	35	M	C	do	do	June 23, 1938	do
22	RHC Jr.	21	M	W	Lewisburg, Ala	do	Apr. 7, 1940	
23	WL	39	M	C	Birmingham, Ala	do	Aug. 1, 1938	
24	RS	24	M	W	do	do	Oct. 21, 1938	
25	GM	27	M	W	Lewisburg, Ala	do	Mar. 27, 1939	
26	RS	22	M	W	do	do	Nov. 28, 1939	
27	AL	25	M	C	do	do	June 10, 1940	
28	CF	39	M	W	Gardendale, Ala	do	June 19, 1940	
29	PE	50-60	F	C	Baltimore, Md		Aug. 19, 1940	
30	SE	58	M	W	do	Poultry dresser	Dec. 10, 1940	
31	EP	57	M	C	do		Feb. 22, 1941	
32	WT	28	M	C	do		Apr. 16, 1941	
33	GY	42	M	W	do	Sewer worker	May 9, 1941	
34	RDC		M	W	Lewisburg, Ala	Coal miner		
35	JM		M		Secaucus, N. J			
36	AG		M		Puerto Rico			
37			M		do			
38	CP		M		do			
39					Connecticut			
40	JE		M		Detroit, Mich			
41	VC		M		do			
42	FH				do			
43	SW				do			
44	HB				do			
45	WF	57	M	W	Baltimore, Md	Carpenter		
46			M	W	Richmond, Va	Marketer		
47	CB		M	C	do	Slaughterer		
48	HG		M	W	do	do		
49	AB	22	F	W	Washington, D. C	Waitress		
50	LH		M	W	Lewisburg, Ala	Coal miner		
51	DF		M	W	do	do		

[1] Died. Typical lesions of Weil's disease noted at post-mortem examination.

cases of Weil's disease in the United States and Puerto Rico

Chill	Fever, °F.	Headache	Nausea and/or vomiting	Pain in chest, legs, or abdomen	Liver enlargement	Conjunctivitis	Hemorrhages	Oliguria	Jaundice	Icteric Index	N. P. N. Mg. (percent)	Blood					Urine					Agglutination test vs. *L. ictero.* Results
												B. P.	Hb. (percent)	R. B. C.	W. B. C.	P. M. N. (percent)	Casts	W. B. C.	R. B. C.	Albumin	Bile	
+	103.5	+	--	--	--	--	+	--	+	17	33	125/80	78	4.0	12,300	85	+	+	+	tr	4+	1:1250
+	103.	+	+	+	--	--	--	--	+(5th day)	--	--	--	--	4.0	12,800	84	--	--	--	3+	+	1:100,000
+	104.	--	+	+	+	+	+	+	+(3d day)	150	122	100/70	68	3.4	15,700	--	--	--	--	+	3+	1:100,000
+	100.6	--	+	+	--	--	--	--	+(2d day)	35.7	--	--	--	4.2	--	--	--	--	--	--	--	1:1000
--	+	+	+	+	+	+	+	+	+(5th day)	76	14	120/80	--	--	10,700	93	+	+	+	+	--	1:100,000
+	103.	--	--	+	--	+	+	--	+(7th day)	152	134	--	--	3.3	21,800	82	+	+	+	+	--	1:100,000
--	104.	+	--	+	--	--	--	--	+(4th day)	--	--	--	--	--	25,000	--	--	--	--	+	--	1:1000
+	101.	+	+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	+	--	1:100,000
+	+	--	--	+	+	--	--	--	+(4th day)	--	--	--	--	--	15,500	94	--	--	--	--	4+	1:100,000
+	100.	--	+	+	+	--	+	--	+	75	75.2	120/65	--	4.5	12,000	80	--	+	--	+	+	1:10,000
+	101.	--	+	--	--	--	+	+	+(3d day)	--	--	--	--	--	--	--	--	--	--	--	--	1:10,000
+	101.5	+	+	+	+	+	+	+	+(Ca. 10th day).	220	--	--	--	--	17,000	92	--	--	--	--	--	1:10,000
--	+	--	+	--	--	+	+	+	+(3d day)	--	60	100/60	--	--	--	--	--	--	--	--	--	1:100,000
+	102.	+	--	--	--	--	--	--	--	--	--	--	--	--	14,000	93	--	--	--	--	--	1:1000
+	+	+	+	--	--	--	+	--	+	--	--	--	--	--	--	--	--	--	--	--	--	1:100,000
--	+	+	--	+	--	--	+	--	+	--	--	--	--	2.5	10,750	70	--	--	--	--	--	1:10,000
+	103.5	+	+	+	+	+	+	+	+(5th day)	300	71	--	83	3.3	40,000	94	+	--	--	+	+	1:100,000
+	+	+	+	+	--	--	--	--	+	112	54	125/90	70	3.6	12,500	81	+	+	+	+	+	1:100,000
+	+	+	+	--	--	--	--	--	+	--	--	--	--	--	--	--	--	--	--	--	--	1:100,000
+	102.4	--	+	+	--	--	--	+	+	71	200	110/80	80	4.0	15,000	88	--	+	+	+	--	(1)
+	+	+	+	+	--	--	--	+	+	80	--	120/90	67	3.6	12,600	83	--	+	--	+	+	(1)
+	103.	--	+	+	--	--	--	--	+	--	109	120/70	68	--	10,600	93	--	+	--	+	+	(1)
+	102.5	--	--	+	--	--	+	--	+	40	--	125/85	66	3.6	6,620	73	+	--	--	--	--	1:100
--	100.5	--	+	+	--	--	+	--	+	129	--	100/60	70	--	10,500	88	--	+	+	--	+	1:1000
+	100.	+	+	--	--	--	--	--	+(8th day)	100	--	--	60	3.8	16,000	86	+	+	+	+	+	1:1000
+	+	+	+	--	+	--	--	+	+(4th day)	--	62	120/88	73	4.0	11,500	80	--	+	+	+	+	1:10,000
--	101	+	+	--	--	--	--	--	+	34	--	--	94	--	27,700	--	--	+	+	+	+	1:100,000
+	104	+	+	--	--	--	+	+	+	23	90	130/80	82	4.2	20,000	96	+	+	+	+	--	1:100,000
+	100	--	--	+	--	--	+	--	+	100	150	118/68	100	4.1	20,200	78	--	+	--	+	+	1:100,000
+	--	--	+	+	--	--	+	--	+(3d day)	100	35	112/68	--	3.4	16,400	--	--	--	--	--	+	1:100,000
+	100.8	--	--	+	--	--	--	--	+	100	50	102/90	--	5.3	9,160	--	--	--	--	+	--	1:1000
+	+	+	+	--	--	--	--	--	+(8th day)	--	--	115/70	80	4.0	13,100	--	+	+	+	+	+	1:10,000
+	+	--	+	+	--	+	+	--	+(7th day)	100	120	108/80	--	5.1	15,700	92	+	+	--	+	--	1:100,000
Jaundiced 2 years before tested																						1:100
No clinical data																						1:100,000
do																						1:1000
do																						1:1000
do																						1:100,000
do																						1:10,000
do																						1:100,000
do																						1:100,000
do																						1:1000
do																						1:1000
do																						1:100
Subclinical or anicteric cases																						1:1000
do																						1:250
do																						1:1000
do																						1:100
do																						1:100
do																						1:100
do																						1:100

REFERENCES

(1) Stimson, A. M.: A note on an organism found in yellow fever tissue. Pub. Health Rep., **22**:541 (1907).

(2) Packchanian, A.: La spirochetose icterohemorragique (maladie de Weil) aux Etats-Unis. Bull. Off. Internat. d'Hyg. Pub., **29**:2350 (1937).

(3) Sellards, A. W.: The interpretation of (?*Spirochaeta*) *interrogans* of Stimson (1907) in the light of subsequent developments. Trans. Roy. Soc. Trop. Med. and Hyg., **33**:545 (1940).

(4) Wadsworth, A., Langworthy, V. H., Stewart, C. F., Moore, A. C., and Moore, M. B.: Infectious jaundice occurring in New York State. J. Am. Med. Assoc., **78**:1120 (1922).

(5) McDowell, E. S.: A case of infectious jaundice. New York State J. Med., **25**:19 (1925).

(6) Sailer, J.: Leptospirosis icterohemorrhagica (Weil's disease). Am. J. Med. Sci., **170**:332 (1925).

(7) Cushing, E. H.: Leptospirosis icterohemorrhagica. J. Am. Med. Assoc., **89**:1041 (1927).

(8) Hayman, J. M., and Lynch, F. B.: Spirochetal jaundice in the United States. Am. J. Med. Sci., **173**:80 (1927).

(9) Towler, H. H., and Walker, J. E.: Spirochetal jaundice. Report of a case. J. Am. Med. Assoc., **89**:86 (1927).

(10) Mulholland, H. B., and Bray, W. E.: Case of spirochetal jaundice in Virginia. J. Am. Med. Assoc., **90**:1113 (1928).

(11) Ball, H. A.: Leptospiral jaundice: A report of two cases. Am. J. Clin. Path., **3**:283 (1933).

(12) Jeghers, H. J., Houghton, J. D., and Foley, J. A.: Weil's disease: Report of case with postmortem observations and review of recent literature. Arch. Path., **20**:447 (1935).

(13) Gaines, A. R., and Johnson, R. P.: Weil's disease: Report of seven cases. Arch. Int. Med., **60**:817 (1937).

(14) Little, O. W.: Spirochetosis icterohaemorrhagica. Report of three cases. Texas State J. Med., **32**:305 (1936).

(15) Laskey, H. G.: Spirochetosis icterohemorrhagica. Rhode Island Med. J., **22**:135 (1939).

(16) Molner, J. G., and Meyer, K. F.: Jaundice in Detroit. Am. J. Pub. Health, **30**:509 (1940).

(17) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Epidemiology of spirochetal jaundice. Am. J. Pub. Health, **29**:347 (1939).

(18) Syverton, J. T., Stiles, W. W., and Berry, G. P.: Epidemiological studies on Weil's disease, with notes on the susceptibility of the "gopher", *Citellus richardsoni* (Sabine) to the experimental inoculation of *Leptospira icterohaemorrhagiae*. J. Bact., **36**:279 (1938).

(19) Goldberg, H. P., and Davens, E. P.: Case presentation: Weil's disease. Bull. Johns Hopkins Hosp., **65**:112 (1941).

(20) Mulholland, H. B.: Weil's disease. Report of a case with autopsy findings. Internat. Clin., **4**:122 (1937).

(21) Martmer, E. E.: Weil's disease: Case occurring in child (dog as source of infection). J. Pediat., **14**:48 (1939).

(22) Glotzer, S.: Weil's disease. Report of case in a fish worker. J. Am. Med. Assoc., **110**:2143 (1938).

(23) Elton, N. W.: Spirochaetal jaundice in Buffalo, New York. Report of a fatal case in a fish merchant. Am. J. Clin. Path., **9**:219 (1939).

(24) Haschec, W., and Tobey, F. J.: Case of spirochetal jaundice. J. Am. Med. Assoc., **113**:1319 (1939).

(25) Blake, F. G.: Weil's disease in the United States. New England J. Med., **223**:561 (1940).

(26) Jentgen, L. N.: Weil's disease. Ohio State Med. J., **37**:443 (1941).

(27) Havens, W. P., Bucher, C. J., and Reimann, H. A.: Leptospirosis: A public health hazard. Report of a small outbreak of Weil's disease in bathers. J. Am. Med. Assoc., **116**:289 (1941).

(28) Ashe, W. F., Pratt-Thomas, H. R., and Kumpfe, C. W.: Weil's disease: A complete review of American literature and an abstract of the world literature. Seven case reports. Medicine, **20**:145 (1941).

(29) Larson, C. L.: A protection test in mice for identification of leptospirosis icterohaemorrhagica (Weil's disease). Pub. Health Rep., **56**:1593 (1941).

SOME SPECIAL EPIDEMIOLOGICAL AND CLINICAL FEATURES OF PLAGUE IN NORTHEASTERN BRAZIL [1]

By Atilio Macchiavello, *Epidemiologist, Pan American Sanitary Bureau*

An epidemiological and bacteriological study of plague in northeastern Brazil extending from August 1939 to September 1940, made in collaboration with Brazilian specialists,[2] brought to light a number of interesting features regarding the disease in man, rats, fleas, and wild rodents in rural areas.[3]

The region studied includes an agricultural district subject to severe droughts, and semidesert areas which alternate with swamps and rocky ground. The following were found to be important factors in the epidemiology of plague in this region: Rains (when human plague increases, as in 1924–26, 1929, 1935, and 1939–40); droughts (when it decreases, owing to less cultivation, migration of local rodents in search of food, fewer fleas, and other conditions); the kind of agriculture (with mandioca, cotton, *mamona*, *poroto* (or peas), and particularly corn, the most attractive to rats, which migrate in search of the corn embryo, possibly for vitamin E); and the type of building construction.

The domestic black rat, *Rattus rattus*, was proved to be the most important factor in rural plague in northeastern Brazil, both human plague and plague among other rodents being accidental and secondary to plague in this rat. If true sylvatic plague does exist in Brazil, as has often been suggested, it has not, in the author's opinion, been conclusively demonstrated.

Xenopsylla cheopis and *X. brasiliensis* were the most common fleas on *R. rattus* and *R. alexandrinus* (which generally lives in the fields); *Rhopalopsyllus* and possibly *Parapsyllus* were found on field rats, preás (*Cavia aperea*) and mocós (*Heredon rupestris*), though these rodents were rarely flea-infested. *X. cheopis* and a *Chiastopsylla* sp. were discovered on *Monodelphis* caught in rat nests. Some *Pulex irritans*, and, rarely, *Echidnophaga gallinacea*, were found on *rattus* and *alexandrinus*. However, *X. cheopis* was the only ectoparasite found plague infected. Even when *X. brasiliensis* were taken from a rat on which infected *cheopis* had been found, they failed to produce plague.

Plague infection was again demonstrated in the preá, *Mus sylvaticus*, and *Mus minusculus*, which previous investigators had found naturally

[1] Résumé taken from a more extended paper appearing in Spanish in the Bulletin of the Pan American Sanitary Bureau, May 1941, p 441 The complete report of these studies in Spanish may be obtained by applying to the Pan American Sanitary Bureau, Washington, D. C.

[2] Brito, Garcia Rosa, Martins de Almeida, E de Silva, Arcoverde, and Trigueros collaborated closely in the epidemiological studies, Paracampos in the bacteriological studies

[3] For a history of plague in Brazil see Bol Of San Pan., Nov. 1940, p 1081. (In English)

infected; and it was reported for the first time in Brazil in *Oryctolagus cuniculus* (rabbit) and *Lepus* sp. (hare), and possibly *Oryzomys intermedius*.

During the studies, two factors were noted which explain many of the puzzling phenomena observed in connection with rural plague in Brazil. In some rural areas, the high external temperatures (sometimes over 96.8° F.) prevent *X. cheopis* from living outside the nests of its rat host, in which the temperature is from 9° to 14.4° F. cooler than that outside. Under these circumstances, plague infection is found only in the nests, where the fleas remain, feeding usually on the young rats. A subterranean epizootic follows, slow in its progress, and with very little human repercussion. Should the weather change and the temperature drop, as happens during the rains, the fleas may leave their shelters, and the epizootic then comes to the surface. This explains the abrupt onset of plague following the rains. It may even spread to wild rodents, possibly through the intermediation of *Monodelphis domesticus* and certain field mice, especially *M. sylvaticus* and *M. minusculus*. An increase in the flea population and in the *cheopis* index of field rats and the presence of *cheopis* on wild rodents have been observed during cooler weather. The human cases, as might be expected, have occurred chiefly among individuals working around rat nests, or among persons whose beds are close to a wall in which rats have their holes.

The rat nests remain inhabited by infected fleas after a large part of the rat population has died. The remaining rats are immune to plague, and the disease would soon die out (the infection in fleas in the tropics, it was again demonstrated, becomes progressively more attenuated and disappears in a few weeks) were it not for the arrival of new susceptible animals, either as the result of breeding or through migration. It is thought that the decreasing virulence of plague in fleas may be responsible for the mildness of human cases at the end of epidemics.

It is believed that an area in which plague has died out because of a lack of susceptible material may be reinfected if the rodent population happens to become sufficiently great at the same time that an opportunity for reintroduction of the plague organism occurs, such as the migration of infected rats. If this happens, however, at a time when one of the periodic nonplague epizootics has practically wiped out the rodent population, reinfection will not occur, but may skip several years until another opportunity arrives. This would explain the reappearance of plague in 5- or 10-year cycles in certain areas. It may be mentioned that no evidence of chronic rat plague was discovered.

The other factor observed was that while the severe, periodic, extensive, and highly fatal epizootics among various wild animals are

due to several nonplague organisms, and are a natural means of reducing the surplus population of a given species, plague epizootics may coexist with them (in the case of rodents). This circumstance and the plague-like characteristics of some of the nonplague epizootics have doubtless been the basis for the assumption that sylvatic plague exists in Brazil. Such epizootics had been observed, however, long before plague entered the country. Plague often coexists with these epizootics when they occur in migrating rodents, either because these rodents carry it with them or because they find it in the invaded regions. The nonplague epizootics are characterized by a different causative agent in each species (at times, however, in different epizootics, different causative agents may be found in the same species); by great severity and high mortality; by the conferring of a specific immunity lasting until the susceptible population is renewed; and by a form of disease usually septicemic in nature. Among the causative organisms discovered were *Pasteurella lepiseptica*, and possibly *Past. pseudotuberculosis*, in rabbits; *Past. avicida* in chickens and ducks; a colibacillus in mocós; and what seemed to be a new species of *Pasteurella* in *Didelphis* sp.[4] The nonplague epizootics among rats were caused by *Past. muricida*, *Loefflerella whitmori*, *Past. pseudotuberculosis rodentium*, a *Klebsiella* which produced paralysis of the lower extremities, a paracolibacillus, and possibly *Trypanosoma lewisi*, with the roles of *Listerella monocytogenes*, *Brucella bronchiseptica*, *Corynebacterium pseudotuberculosis murium*, and *Actinobacillus* sp., undetermined, though these organisms were found.

It was observed that, when a nonplague epizootic attacks a plague-infected rat community, there is a rapid increase in rat mortality, a rise in the flea index among the survivors, and an increase in the number of human cases of plague. The rapid increase in rat mortality, leading almost to complete extermination of the rat population, results in an abrupt decline in the number of cases of rat and human plague and cessation of the nonplague epizootic. After the epizootic ends, one or two cases of human plague may occur, possibly due to some remaining infected fleas. In wild rodents, the mixed infection makes it difficult to demonstrate plague, because, whereas plague requires at least 3 days to develop, the other disease produces an acute septicemia in less than 48 hours. During the investigations, five types of plague epizootics and three types of murine migrations were studied in detail.

With regard to human plague, the most common type was bubonic. There was, however, a lower mortality, and a lesser tendency of the buboes to suppurate, than in classic plague. No pneumonic plague, either primary or secondary, was observed. There were 20 cases of

[4] Should this indeed prove a new type, the author suggests that it be named *Past longi*, in recognition of the many years of plague work of Dr. John D. Long.

primary septicemic plague, some of which exhibited gastrointestinal and pulmonary symptoms, and jaundice.

The investigators were able to present the first bacteriologic proof that *ingua de frío* is actually plague. This disease, also known as *febre de caroço,* though the term was originally applied to ordinary bubonic plague, appears generally in children under 15, and is characterized by mild and transitory symptoms, monoglandular swellings without much inflammation or pain, and a tendency of the gland swelling to become ligneous, and to reoccur, or to be reabsorbed. It appears sporadically where plague is endemic and tends to disappear when epidemic. There is no special relationship between cases, though they occasionally appear in small foci. In some of these foci the first cases are severe and even fatal, the later ones becoming increasingly milder. There is a history of previous plague in *rattus*; and it is possible that this type of plague may have some relation to an attenuated virus in fleas.

A new plague syndrome was observed—a multiglandular fever. This was found in 9 out of 263 cases, and followed a prolonged course with a severe effect on the patient. It was characterized by septicemic fever, wasting, sometimes cachexia, pronounced anemia, multiple successive buboes about the size of an orange, with a tendency to suppurate, alopecia, frequent gastrointestinal and (or) urinary symptoms, and low mortality. The average case had more than 3 buboes (41.3 percent cervical, 37.9 percent inguinal, 13.8 percent cephalic, and 6.9 percent axillary), which usually appeared after the onset of the general symptoms. The clinical picture was that of attentuated plague (with *P. pestis* in the buboes but not in the blood), with septicemia. The latter was due in 3 cases to a paracolibacillus, in 3 to *Brucella bronchiseptica,* in 1 case to *Klebsiella* sp., and in 1 to *Past. pseudotuberculosis rodentium* (believed to be the sixth or seventh reported case of human infection with this organism, and the first of a mixed infection of it and plague). These cases appeared on the border areas of plague-infected and plague-free zones where conditions might be considered more or less unfavorable to plague.

The strains of the plague organism from *ingua de frío* studied in the laboratory were quite fragile and seemed to have lost their invasive power while retaining the power to produce a potent endotoxin. Those of the multiglandular fever were typical of, though less virulent than, ordinary strains.

The extensive epizootics seen among domestic cats in Brazil were found to be due, in some cases at least, to a filterable virus, and the disease was given the descriptive name "adeno-myelo-enterosis" by the author and his collaborator, Bezerra Coutinho. It was felt that there may be a definite relationship between this disease and migrating rats, since the rats can harbor the causative virus in the brain

for as long as 90 days. They may well be able to carry it from city to city, giving rise to the successive cat epizootics which have been observed. The cats, in their turn, harbor the same paracolibacillus which gives rise to severe murine epizootics, and which is present in their undigested, diarrheal alvine discharges.

Some 40 plague strains of human, murine, preá, rabbit, flea, and other origin were studied, including a murine strain from rats from Recife, where there had been no human plague. Among the observations may be mentioned the finding that the morphology and appearance of plague cultures depended on the organ from which the strain was taken and on the culture medium, rather than, for instance, on virulence, although the smooth form, when present in flat colonies, or those with a depressed center, was usually the least virulent. Survival studies of *P. pestis* showed tropical conditions to be very unfavorable to it. It was observed that gram-negative bacilli, such as may cause some nonplague epizootics, were antagonistic to the development of plague organisms. Plague cultures from bone marrow for diagnostic purposes were not as successful as they have been reported elsewhere.

It is suggested that further investigation include, among other things, the study of the possible influence of cold weather and of feeding on the blood of susceptible animals in reviving the virulence of plague in fleas; the possibility of reviving the discredited biologic prophylaxis in view of nonplague epizootics in rats; and measures to destroy fleas in rat nests. (Flame-throwers and cyanogas are among the measures now being used.)

PREVALENCE OF ENCEPHALITIS IN THE UNITED STATES

A serious outbreak of encephalitis has been reported in some of the West North Central States since the first of July. On July 14, Dr. Maysil M. Williams, State Health Officer of North Dakota, reported the occurrence of 25 cases in that State from July 1 to 12.[1] Ten cases had been reported in the State during the first half of the year. Up to August 9, a total of 363 cases, with 41 deaths, had been reported in North Dakota.

Recent reports show an increasing number of cases of the disease in both South Dakota and Minnesota. In the latter State a high incidence has been reported in the western area adjacent to North Dakota.

The type of the disease has not yet been definitely determined, although there is some evidence that it is the western equine type. Medical officers and entomologists of the United States Public Health Service are collaborating with the State health departments in an

[1] Pub. Health Rep., July 18, 1941, p. 1849.

investigation of the outbreak, with particular reference to the type of the disease and the method of spread. Especial consideration is being given to the possibility of insect vectors and to the existence of some natural reservoir of the disease.

The numbers of cases reported in the 3 States to August 9 this year are as follows:

State	Jan.-June 1941	Week ended—					
		July 5	July 12	July 19	July 26	Aug. 2	Aug. 9
North Dakota	10		[1] 25	31	65	54	178
South Dakota	0					19	61
Minnesota	2	8	1	11	39	35	65

[1] July 1-12.

Incomplete figures show approximately 950 cases of encephalitis reported in the United States for the year to date, i. e., up to August 9, 1941, as compared with 541 cases for the period January to August, inclusive, in 1940. Of 108 cases reported in Washington State last year, 86 were stated to be the equine type of disease, and of 3 cases reported in Nevada, 1 case was recorded as equine encephalitis. No other States designated the type of the disease in their reports for 1940.

DEATHS DURING WEEK ENDED AUGUST 2, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 2, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,516	8,763
Average for 3 prior years	7,714	
Total deaths, first 31 weeks of year	270,113	271,522
Deaths per 1,000 population, first 31 weeks of year, annual rate	12.2	12.2
Deaths under 1 year of age	585	562
Average for 3 prior years	502	
Deaths under 1 year of age, first 31 weeks of year	16,352	15,690
Data from industrial insurance companies:		
Policies in force	64,399,236	65,006,071
Number of death claims	10,739	11,753
Death claims per 1,000 policies in force, annual rate	8.7	9.5
Death claims per 1,000 policies, first 31 weeks of year, annual rate	9.9	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control diseases without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 9, 1941

Summary

A total of 422 cases of poliomyelitis was reported during the current week as compared with 326 for the preceding week. The number of cases reported currently and the total number reported to date (first 32 weeks) are above the figures for corresponding periods of any year since 1937.

The South Atlantic and East South Central States reported 261, or 62 percent of the total cases for the current week. States reporting 10 or more cases for the current week (with last week's figures in parentheses) are as follows: Alabama 80 (49); Georgia 71 (71); Tennessee 31 (13); New York 30 (12); Ohio 27 (16); Pennsylvania 17 (15); South Carolina 16 (5); New Jersey 13 (5); Kentucky 13 (7); Florida 13 (27); Minnesota 12 (3); Indiana 12 (5); Maryland 11 (14); Michigan 10 (8); North Carolina 10 (0); and Mississippi 10 (9).

North Dakota reported 178 cases of encephalitis, Minnesota 65, and South Dakota 61. A total of 363 cases, with 41 deaths, has been reported in North Dakota up to August 9, and recent reports show increasing incidence in South Dakota, and in Minnesota, especially in areas near the North Dakota border.[1]

Of 22 cases of Rocky Mountain spotted fever reported, only 3 occurred in the Mountain States. Four cases were reported in Maryland and 3 cases each in Illinois and North Carolina. Of 86 cases of endemic typhus fever, 34 cases occurred in Texas, 20 in Georgia, and 14 in Florida.

The death rate for the current week in 88 large cities is 10.6 per 1,000 population as compared with 11.9 for the preceding week and with a 3-year (1938–40) average of 10.1.

[1] See page 1661.

Telegraphic morbidity reports from State health officers for the week ended August 9, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1940	
NEW ENG.												
Maine	0	0	0	------	------	------	12	30	5	0	0	0
New Hampshire	0	0	0	------	------	------	2	1	1	0	0	0
Vermont	0	0	0	------	------	------	14	3	2	0	0	0
Massachusetts	1	6	6	------	------	------	83	191	88	0	0	0
Rhode Island	1	0	0	------	------	------	2	11	1	0	0	0
Connecticut	1	0	1	------	------	------	34	7	15	1	0	0
MID. ATL.												
New York [1]	13	8	11	[2] 1	[2] 1	[2] 2	208	288	202	7	3	3
New Jersey [3]	1	2	2	2	2	2	66	124	50	1	1	1
Pennsylvania [3]	8	10	13	------	------	------	156	118	118	2	1	4
E. NO. CEN.												
Ohio	3	2	7	3	4	4	77	19	19	2	1	1
Indiana	3	7	7	1	2	3	11	6	6	1	0	2
Illinois [3]	15	11	14	2	4	4	40	58	30	0	0	1
Michigan [4]	1	5	6	------	4	------	88	153	60	0	0	0
Wisconsin	0	0	2	5	19	14	159	141	61	0	0	0
W. NO. CEN.												
Minnesota	3	0	1	------	------	1	9	14	11	0	0	0
Iowa [3]	0	2	2	------	------	1	24	30	21	0	0	1
Missouri [3]	1	0	5	1	------	14	23	2	2	0	0	0
North Dakota	3	7	2	5	------	------	5	1	2	0	1	1
South Dakota	5	0	1	------	------	------	3	1	2	0	0	0
Nebraska	0	2	1	------	------	------	10	1	1	0	0	0
Kansas	1	6	3	1	------	------	25	14	6	0	0	0
SO. ATL.												
Delaware	0	1	0	------	------	------	2	0	0	0	0	0
Maryland [3 4]	3	3	3	------	4	2	65	5	6	2	1	1
Dist. of Col. [3]	1	1	2	------	------	------	11	1	5	0	0	0
Virginia [1]	8	9	10	74	46	------	74	37	31	1	0	1
West Virginia [3 4]	1	0	3	2	1	4	48	5	3	0	1	1
North Carolina [3]	15	6	22	3	9	------	62	14	14	1	0	1
South Carolina [1]	7	4	8	134	110	71	58	7	5	1	2	0
Georgia [1 3]	15	2	10	16	5	------	59	6	------	0	0	0
Florida [1]	1	1	4	4	------	1	9	4	2	0	1	0
E. SO. CEN.												
Kentucky	1	3	10	1	4	1	14	27	14	2	1	1
Tennessee [1]	1	4	7	10	6	9	41	6	6	2	0	2
Alabama [1]	11	8	11	16	3	11	8	26	4	1	2	2
Mississippi [1 4]	2	0	10	------	------	------	------	------	------	2	1	1
W. SO. CEN.												
Arkansas	6	3	7	15	4	7	32	0	0	0	0	0
Louisiana [1]	1	3	5	------	3	7	2	0	4	1	0	0
Oklahoma	0	3	4	7	36	11	15	1	2	0	2	0
Texas [1]	25	15	20	348	151	39	106	52	33	0	2	3
MOUNTAIN												
Montana [3]	1	0	0	------	3	------	1	8	8	0	0	0
Idaho	0	0	0	------	------	------	0	0	2	0	0	0
Wyoming [3]	3	2	1	------	------	------	5	2	2	2	0	0
Colorado	6	4	4	11	6	------	23	4	8	0	0	0
New Mexico	0	0	0	------	------	------	7	9	5	0	0	0
Arizona	0	1	1	18	6	7	5	9	9	1	0	0
Utah [3 4]	0	0	0	1	------	------	10	12	12	0	0	0
Nevada	0	------	------	------	------	------	5	------	------	0	------	------
PACIFIC												
Washington	0	2	1	------	------	------	1	4	12	0	0	0
Oregon	2	0	0	4	1	1	6	25	11	2	0	0
California	8	10	17	32	17	5	101	62	67	0	0	2
Total	173	153	297	717	451	279	1,821	1,539	1,111	32	20	42
32 weeks	7,460	8,688	13,402	599,256	168,789	151,299	829,197	227,464	269,437	1,391	1,138	2,114

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 9, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1940		Aug. 9, 1941	Aug. 10, 1910	
NEW ENG.												
Maine	0	1	0	0	1	2	0	0	0	0	1	3
New Hampshire	1	0	0	5	2	1	0	0	0	1	0	0
Vermont	1	0	1	1	3	0	0	0	0	0	0	0
Massachusetts	4	0	2	59	21	21	0	0	0	3	2	2
Rhode Island	0	0	0	3	0	3	0	0	0	0	0	2
Connecticut	1	2	2	6	4	4	0	0	0	0	3	2
MID. ATL.												
New York [1]	30	7	9	61	65	71	0	0	0	30	16	16
New Jersey [3]	13	1	3	19	18	14	0	0	0	4	10	6
Pennsylvania [3]	17	1	3	41	57	57	0	0	0	28	15	22
E. NO. CEN.												
Ohio	27	16	9	50	33	61	0	0	0	10	8	16
Indiana	12	41	1	8	11	23	1	0	0	3	6	7
Illinois [3]	8	4	8	35	53	64	1	0	2	16	7	35
Michigan [4]	10	31	24	35	46	76	0	0	1	2	6	12
Wisconsin	1	0	2	34	35	31	0	1	1	0	0	2
W. NO. CEN.												
Minnesota	12	1	4	9	12	19	0	5	3	1	3	1
Iowa [3]	0	19	2	5	6	9	0	0	2	5	5	5
Missouri [3]	0	12	3	12	13	15	1	0	1	0	19	10
North Dakota	0	0	0	0	3	5	0	0	0	1	5	0
South Dakota	0	2	0	6	4	5	1	3	1	1	0	0
Nebraska	0	1	1	5	5	5	0	1	1	0	1	1
Kansas	1	26	6	12	16	24	0	0	0	7	5	5
SO. ATL.												
Delaware	0	0	0	0	0	1	0	0	0	0	0	1
Maryland [3,4]	11	1	1	9	10	10	0	0	0	11	3	12
Dist. of Col.[3]	2	0	0	3	1	2	0	0	0	0	2	2
Virginia [1]	3	5	2	15	9	9	0	0	0	9	8	23
West Virginia [3,4]	1	20	1	7	11	12	0	0	0	5	6	22
North Carolina [3]	10	2	2	18	16	25	0	1	0	13	3	13
South Carolina	16	0	2	1	1	1	0	0	0	8	10	15
Georgia [1,3]	71	0	0	6	7	6	0	0	0	27	23	26
Florida [1]	13	0	2	2	4	2	0	0	0	6	4	3
E. SO. CEN.												
Kentucky	13	16	4	8	13	17	0	0	0	17	16	43
Tennessee [1]	31	3	1	12	7	8	0	0	0	12	11	30
Alabama [1]	80	1	2	14	4	8	0	0	0	13	14	18
Mississippi [1,4]	10	0	2	1	6	3	0	0	0	15	14	13
W. SO. CEN.												
Arkansas	3	1	0	2	6	6	0	0	0	15	30	23
Louisiana [1]	2	5	1	0	1	5	0	0	0	8	14	19
Oklahoma	1	5	2	9	4	6	0	1	0	4	19	21
Texas [1]	4	12	1	7	9	17	0	0	0	28	72	87
MOUNTAIN												
Montana [3]	0	8	1	5	5	5	1	0	0	1	1	1
Idaho	0	0	0	1	2	2	0	0	0	0	0	1
Wyoming [3]	0	1	0	0	3	2	0	0	0	0	1	1
Colorado	1	1	1	4	8	11	0	12	0	5	1	2
New Mexico	0	1	1	1	0	5	0	0	0	2	2	6
Arizona	0	0	0	5	0	1	0	0	0	2	0	1
Utah [3,4]	2	1	0	1	5	5	0	0	0	1	3	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	3	16	0	8	1	8	0	0	0	0	0	2
Oregon	0	2	1	5	6	7	0	0	0	3	0	3
California	7	12	12	35	35	39	0	1	3	4	15	15
Total	422	278	261	585	582	708	5	25	25	330	384	608
32 weeks	2, 273	1, 681	1, 681	91, 371	118, 285	136, 453	1, 178	1, 952	7, 914	4, 143	4, 592	6, 602

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 9, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough	
	Week ended	
	Aug. 9, 1941	Aug. 10, 1940
NEW ENG.		
Maine	20	38
New Hampshire	0	0
Vermont	3	14
Massachusetts	171	147
Rhode Island	25	1
Connecticut	49	25
MID. ATL.		
New York [1]	272	343
New Jersey [3]	99	91
Pennsylvania [3]	216	426
E. NO. CEN.		
Ohio	435	243
Indiana	21	18
Illinois [3]	204	152
Michigan [4]	309	287
Wisconsin	233	83
W. NO. CEN.		
Minnesota	58	44
Iowa [3]	48	42
Missouri [3]	9	31
North Dakota	2	13
South Dakota	4	8
Nebraska	13	5
Kansas	101	50
SO. ATL.		
Delaware	0	6
Maryland [3 4]	74	118
Dist. of Col.[3]	21	6
Virginia [1]	81	36
West Virginia [3 4]	21	50
North Carolina [3]	158	146
SO. ATL.—continued		
South Carolina [1]	124	21
Georgia [1 3]	37	20
Florida [1]	19	6
E. SO. CEN.		
Kentucky	60	58
Tennessee [1]	27	54
Alabama [1]	4	9
Mississippi [1 4]	----------	----------
W. SO. CEN.		
Arkansas	4	18
Louisiana [1]	15	27
Oklahoma	22	22
Texas [1]	178	223
MOUNTAIN		
Montana [3]	26	2
Idaho	46	7
Wyoming [3]	10	5
Colorado	110	9
New Mexico	4	8
Arizona	14	5
Utah [3 4]	33	55
Nevada	4	----------
PACIFIC		
Washington	81	40
Oregon	14	30
California	203	260
Total	3,772	3,302
32 weeks	143,396	103,877

[1] Typhus fever, week ended August 9, 1941, 86 cases as follows: New York, 1; Virginia, 1; South Carolina, 2; Georgia, 20; Florida, 14; Tennessee, 1; Alabama, 6; Mississippi, 2; Louisiana, 5; Texas, 34.

[2] New York City only.

[3] Rocky Mountain spotted fever, week ended August 9, 1941, 22 cases as follows: New Jersey, 1; Pennsylvania, 1; Illinois, 3; Iowa, 1; Missouri, 2; Maryland, 4; District of Columbia, 2; West Virginia, 1; North Carolina, 3; Georgia, 1; Montana, 1; Wyoming, 1; Utah, 1.

[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 26, 1941

This table summarizes the reports received weekly from a selected list of 90 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	74	25	10	725	280	284	4	345	57	1,408	-------
Current week	49	29	6	703	228	223	0	307	31	1,285	-----
Maine:											
Portland	0	------	0	0	1	0	0	0	0	17	20
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	4
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	6
Massachusetts:											
Boston	2	------	0	40	9	16	0	4	0	34	174
Fall River	0	------	1	0	1	5	0	0	0	13	28
Springfield	0	------	0	14	0	3	0	2	0	8	41
Worcester	0	------	0	1	3	5	0	4	0	3	54
Rhode Island:											
Providence	3	------	0	10	3	1	0	2	0	44	35
Connecticut:											
Bridgeport	0	------	0	8	0	0	0	0	0	1	27
Hartford	0	------	0	3	0	0	0	1	0	1	40
New Haven	0	------	0	2	1	0	0	1	0	5	41
New York:											
Buffalo	0	------	1	7	8	6	0	4	0	3	94
New York	5	4	1	52	35	25	0	68	5	115	1,238
Rochester	0	------	0	11	1	0	0	0	0	0	64
Syracuse	0	------	0	19	0	2	0	1	0	17	35
New Jersey:											
Camden	0	------	0	0	1	0	0	1	0	9	21
Newark	0	------	0	7	4	6	0	3	0	17	76
Trenton	0	------	0	3	0	1	0	0	0	1	34
Pennsylvania:											
Philadelphia	2	2	2	7	12	9	0	16	3	36	394
Pittsburgh	1	------	0	39	5	5	0	4	0	67	134
Reading	0	------	0	2	0	0	0	1	0	1	14
Ohio:											
Cincinnati	0	1	0	18	6	4	0	7	2	5	114
Cleveland	0	1	0	5	4	13	0	7	0	81	187
Columbus	0	------	0	9	0	1	0	5	0	16	74
Indiana:											
Fort Wayne	0	------	0	1	1	0	0	0	0	4	19
Indianapolis	2	------	0	5	2	3	0	5	0	8	101
South Bend	0	------	0	2	0	0	0	0	0	0	20
Terre Haute	0	------	0	0	0	0	0	1	0	0	11
Illinois:											
Chicago	10	1	1	16	9	25	0	46	0	66	620
Springfield	0	------	0	14	3	1	0	0	0	0	17
Michigan:											
Detroit	0	------	0	32	8	19	0	9	0	75	256
Flint	0	------	0	1	1	0	0	0	0	9	15
Grand Rapids	0	------	0	11	1	3	0	0	0	5	32
Wisconsin:											
Kenosha	0	------	0	4	0	1	0	0	0	0	8
Milwaukee	0	------	0	82	1	1	0	2	0	73	86
Racine	0	------	0	10	0	1	0	0	0	8	12
Superior	0	------	0	2	1	1	0	0	0	8	6
Minnesota:											
Duluth	0	------	0	2	0	0	0	0	0	13	18
Minneapolis	0	------	0	1	1	2	0	1	0	6	97
St. Paul	0	------	0	3	7	1	0	0	0	14	73
Missouri:											
Kansas City	0	------	0	8	3	3	0	4	0	13	102
St. Joseph	0	------	0	0	7	0	0	0	0	0	29
St. Louis	2	2	0	10	6	4	0	9	0	24	173
North Dakota:											
Fargo	0	------	0	0	0	0	0	1	0	5	14
Nebraska:											
Omaha	0	------	0	1	0	2	0	1	0	1	48
Kansas:											
Topeka	0	------	0	3	1	1	0	0	0	35	13
Wichita	0	------	0	0	6	0	0	1	0	6	40

City reports for week ended July 26, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Delaware:											
Wilmington	0	------	0	2	2	3	0	0	0	0	21
Maryland:											
Baltimore	0	1	0	116	1	9	0	7	0	63	164
Cumberland	0	------	0	1	0	0	0	0	0	0	12
Frederick	0	------	0	1	0	0	0	0	0	0	4
District of Columbia:											
Washington	0	------	0	14	5	3	0	13	0	12	166
Virginia:											
Lynchburg	1	------	0	11	0	0	0	0	0	4	10
Richmond	1	------	0	2	0	0	0	1	3	0	39
Roanoke	0	------	0	1	0	0	0	0	0	4	8
West Virginia:											
Charleston	0	------	0	0	2	0	0	1	0	0	30
Wheeling	0	------	0	1	1	0	0	1	0	1	17
North Carolina:											
Raleigh	0	------	0	4	0	0	0	0	0	15	16
Wilmington	0	------	0	0	0	0	0	0	0	24	13
Winston-Salem	0	------	0	7	0	0	0	2	0	6	13
South Carolina:											
Charleston	0	1	0	0	1	2	0	1	1	6	14
Georgia:											
Atlanta	0	------	0	0	2	1	0	5	1	0	77
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	0	1	0	10	2	0	0	3	0	2	27
Florida:											
Tampa	1	------	0	0	0	0	0	1	0	4	16
Tennessee:											
Memphis	0	5	0	4	2	0	0	6	2	10	88
Nashville	0	------	0	4	1	0	0	4	2	11	49
Alabama:											
Birmingham	0	1	0	3	1	1	0	3	2	3	57
Mobile	0	------	0	0	2	0	0	0	0	0	23
Arkansas:											
Little Rock	0	------	0	1	1	0	0	0	0	1	20
Louisiana:											
New Orleans	1	------	0	0	8	6	0	10	2	2	149
Shreveport	0	------	0	0	3	0	0	1	0	0	45
Texas:											
Dallas	0	------	0	3	0	3	0	1	3	1	65
Galveston	0	------	0	0	1	0	0	1	0	0	12
Houston	5	------	0	4	5	2	0	4	3	2	70
San Antonio	0	1	0	1	10	1	0	5	0	4	67
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	11
Great Falls	0	------	0	0	1	0	0	0	0	5	8
Helena	0	------	0	0	0	0	0	0	0	0	5
Missoula	0	------	0	0	0	1	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	1	0	0	0	0	7
Colorado:											
Denver	9	------	0	13	3	0	0	0	0	76	76
Pueblo	0	------	0	3	1	0	0	0	1	3	13
Utah:											
Salt Lake City	0	------	0	2	0	1	0	0	1	32	24
Washington:											
Seattle	1	------	0	0	6	2	0	4	0	16	130
Spokane	0	------	0	0	2	2	0	0	0	8	32
Tacoma	0	------	0	0	1	1	0	0	0	18	23
California:											
Los Angeles	2	7	0	23	6	9	0	14	0	59	331
Sacramento	1	------	0	0	0	1	0	1	0	4	28
San Francisco	0	1	0	7	6	4	0	7	0	13	169

City reports for week ended July 26, 1941—Continued

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Polio-myelitis cases
Massachusetts:			
Springfield	0	0	1
New York:			
New York	4	1	4
Pennsylvania:			
Philadelphia	1	0	0
Pittsburgh	0	0	1
Ohio:			
Cleveland	0	0	8
Illinois:			
Chicago	0	0	2
Michigan:			
Detroit	0	0	4
Grand Rapids	0	0	1
Wisconsin:			
Superior	0	0	1
Minnesota:			
Minneapolis	0	0	4
Missouri:			
St. Louis	1	0	1
Maryland:			
Baltimore	2	0	3
District of Columbia:			
Washington	0	0	1
West Virginia:			
Wheeling	0	0	1
South Carolina:			
Charleston	1	0	0
Georgia:			
Atlanta	0	0	13
Savannah	0	0	1
Alabama:			
Birmingham	0	0	8
Louisiana:			
New Orleans	0	0	1
Shreveport	0	1	0
Texas:			
San Antonio	1	0	0
Utah:			
Salt Lake City	0	0	1
California:			
Los Angeles	0	0	5
San Francisco	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Fargo, 17. Deaths: Fargo, 2; Seattle, 1.
Pellagra.—Cases: Boston, 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 4.
Rabies in man.—Deaths: Nashville, 1.
Typhus fever.—Cases: New York, 5; Tampa, 1; New Orleans, 1; Houston, 1; Los Angeles, 1.

PLAGUE INFECTION IN COLORADO, MONTANA, NORTH DAKOTA, AND WASHINGTON

Plague infection has been reported, under dates of July 29 and 30, and August 1, 1941, to have been found upon examination of specimens at the laboratory in San Francisco, Calif., as follows:

IN GROUND SQUIRRELS, MARMOTS, AND FLEAS IN SAN MIGUEL COUNTY, COLO.

In tissue from a ground squirrel, *C. variegatus grammurus*, shot July 16 on a ranch 3 miles west and 6 miles south of Placerville; in tissue from 2 marmots, *Marmota flaviventris*, shot July 17 at Horsefly Mesa, 27 miles south of Montrose; and in a pool of 30 fleas from 5 marmots of the same species, shot 3 miles west of Placerville on July 14.

IN FLEAS FROM GROUND SQUIRRELS IN BEAVERHEAD COUNTY, MONT.

In a pool of 77 fleas from 120 ground squirrels, *C. columbianus*, shot 3 miles west of Big Hole Battlefield.

IN FLEAS FROM GROUND SQUIRRELS IN DIVIDE COUNTY, N. DAK.

In 3 pools of fleas from ground squirrels, *C. richardsonii*, one a pool of 48 fleas from 44 ground squirrels shot July 11 on a ranch approximately 7 miles northeast of Crosby, another a pool of 54 fleas from 41 ground squirrels, shot 4½ miles north of Crosby on July 11, and the

third a pool of 61 fleas from 49 ground squirrels shot July 12 on a ranch about 8 miles northeast of Crosby.

IN A GROUND SQUIRREL AND FLEAS FROM GROUND SQUIRRELS IN STEVENS COUNTY, WASH.

In tissue from a ground squirrel, *C. columbianus*, shot July 8 at a camp in Kauiksu National Forest, 15 miles northeast of Coleville, and in a pool of 175 fleas from 55 ground squirrels of the same species, shot July 12 along Twelve Mile Creek, 14 miles southeast of Coleville.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—Rats proved positive for plague infection have been reported from Kalopa Homesteads, Hamakua District, Island of Hawaii, T. H., as follows: 1 rat, July 8; and 2 rats, July 11.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 5, 1941.—During the week ended July 5, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	2	3	1	5	6		2	3		22
Chickenpox		17		55	159	59	55	45	37	427
Diphtheria		9		18	1	5				33
Dysentery				3						3
Influenza		7			2		2		79	90
Lethargic encephalitis									1	1
Measles		19	6	255	461	41	48	10	61	901
Mumps				54	87	4	42	20	4	211
Pneumonia		3				1			4	8
Poliomyelitis					1					1
Scarlet fever		7	4	54	119	4	11	7	13	219
Tuberculosis	3	35	8	43	41	2	87	1		170
Typhoid and paratyphoid fever			1	23	1					25
Whooping cough		1		275	119		2	3	22	422

Manitoba—Poliomyelitis.—Information received under date of August 8, 1941, states that 97 new cases of poliomyelitis were reported in the Province of Manitoba for the week ended August 8, making a total of 288 cases since July 1, 1941.

To date, the number of cases reported is more than half the total recorded during the epidemic of 1936, when there were 539 cases with 33 deaths.

No cases of poliomyelitis have been reported from the various military training camps in Manitoba.

SWITZERLAND

Communicable diseases—April 1941.—During the month of April 1941, cases of certain communicable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	33	Poliomyelitis	2
Chickenpox	165	Scarlet fever	291
Diphtheria	79	Trachoma	2
German measles	333	Tuberculosis	304
Influenza	30	Typhoid fever	4
Measles	398	Undulant fever	16
Mumps	103	Whooping cough	190
Paratyphoid fever	1		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Burma—Akyab.—A report dated July 2, 1941, stated that the town and port of Akyab, Burma, had been declared by the Government to be infected with cholera from June 27, 1941.

China.—During the period July 5 to 26, 1941, cases of cholera were reported in China as follows: Macao, 132; Shanghai, 27.

Plague

Palestine—Haifa.—Information dated July 29, 1941, reported the occurrence of 2 cases of human plague in Haifa during the week.

Indochina (French)—Cochinchina—Chaudoc.—During the period June 20–30, 1941, 17 fatal cases of plague were reported in Chaudoc.

Smallpox

The report of 1 case of smallpox in Santiago de Cuba, Cuba, for the week ended April 5, 1941 (Public Health Reports, May 9, 1941, p. 1038; May 30, 1941, p. 1188; June 27, 1941, p. 1348; and July 25, 1941, p. 1533) was an error. Later information states that this was a case of measles, and was erroneously recorded as smallpox.

Yellow Fever

Brazil.—Deaths from yellow fever have been reported in Brazil as follows: Para, June 2, 1; Bahia, June 12, 1; June 13, 1.

X

Public Health Reports

VOLUME 56 AUGUST 22, 1941 NUMBER 34

IN THIS ISSUE

Distribution of Health Services in State Government

Note on Epidemiology of Rocky Mountain Spotted Fever

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

THE PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • AUGUST 22, 1941 • *No. 34*

DISTRIBUTION OF HEALTH SERVICES IN THE STRUCTURE OF STATE GOVERNMENT*

CHAPTER I. THE COMPOSITE PATTERN OF STATE HEALTH SERVICES

By JOSEPH W. MOUNTIN, *Assistant Surgeon General*, and EVELYN FLOOK, *United States Public Health Service*

The desirability of periodically taking stock of the organization, activities, policies, and resources of the agencies responsible for public health work in the various States has been recognized for over a quarter of a century. In 1914 the Council on Health and Public Instruction of the American Medical Association requested Dr. Charles V. Chapin, of Providence, Rhode Island, to make a survey of the activities, equipment, and accomplishments of the various State boards of health. Dr. Chapin's report was published by the American Medical Association in 1915.

Ten years later the Conference of State and Provincial Health Authorities of North America agreed that it was impossible to evaluate progress or trends in the field of public health without current information which might be compared with that collected at an earlier date. Consequently, that body passed a resolution requesting the International Health Division of the Rockefeller Foundation to collect and compile the data necessary to show what changes had taken place between 1915 and 1925. The results of this survey were published by the United States Public Health Service in Public Health Bulletin No. 184 entitled "Health Departments of States and Provinces of the United States and Canada." In addition to material comparative with the earlier report, this bulletin contained certain information regarding financial resources, personnel, salaries, expenditures, and activities which was not included in the report of the American Medical Association survey.

*From the States Relations Division. This is the first chapter of the third edition of Public Health Bulletin No. 184. Succeeding chapters will be published in subsequent issues of the PUBLIC HEALTH REPORTS.

A few years later Public Health Bulletin 184 was revised and again published by the United States Public Health Service. As before, the International Health Division of the Rockefeller Foundation assembled the data. The particular event leading up to this revision was the second White House Conference on Child Health and Protection. In preparing for the Conference, the section on Health Service and Administration asked the International Health Division to collect data from the States in regard to the organization of official health agencies. Inasmuch as information in the original Bulletin 184 was out of date, the necessary additional data were gathered for the new edition in 1930 and published in 1932.

Since 1930 there has been no source of information which comprehensively describes prevailing health organization, policies, and practices at the State level. That no decade in the history of public health work has witnessed more far-reaching changes in organization and scope of service than the period between 1930 and 1940 is a statement which has been made often enough to be labeled as platitudinous. Although those who are interested in public health progress know that there is a sound foundation for this somewhat trite observation, their knowledge is apt to be based upon vague generalities rather than upon specific facts. It is realized, of course, that the effect of the Federal Social Security Act and of the Federal Venereal Disease Control Act has been felt by all States, and in varying degrees. Federal grants-in-aid under Title V, Title VI, and Venereal Disease Control Act funds have made possible expansion of health activities long engaged in by some States and initiation of new services by others. Furthermore, during the past ten years there has been envisioned a broader scope of public responsibility for health measures than had previously prevailed. Many health departments are now participating in programs which in 1930 would have been regarded as outside the realm of public health concern.

In spite of the implications of so noticeable a change in public health practices, few concrete expressions of this change have been published, and these few have been for selected areas only. Once more recognizing the need for definite, up-to-date, Nation-wide information concerning the functions of State agencies engaged in health work, the Conference of State and Provincial Health Authorities requested that Public Health Bulletin No. 184 again be revised to describe the situation as it existed for the year 1940. This time the United States Public Health Service was elected to carry the full burden of collecting, compiling, interpreting, and publishing the data. The survey was to cover the forty-eight States, the District of Columbia, the Territories of Alaska, Hawaii, and Puerto Rico, and the Virgin Islands.

In general, the 1940 edition of Public Health Bulletin No. 184 was planned to carry much of the same sort of information as is contained in the earlier publications. However, a rather fundamental shift of emphasis has been made. The first two editions were designed to deal solely with public health administrative practices as limited to and defined by the State department of health. The present version gives consideration to the health activities of all State agencies, since, with the tremendous increase in Federal grants and the substantial augmentation of State and local budgets, the pattern of practice is no longer so simple as it was some years ago. As stated before, the concept of public responsibility in matters pertaining to community and personal health has undergone a marked transition through the passage of time. Recently, more and more attention has been given to improvement of the personal health of every citizen. Provision of facilities for the diagnosis and treatment of cancer, pneumonia, dental defects, and crippling conditions, and the introduction of programs of industrial hygiene and general medical care for the needy bear witness to the newer trend of social thought. Prevention of the development of mental disorders and an increased attack upon the venereal diseases are other features now receiving special consideration. These newer lines of activity are not substitutes for such services as control of communicable diseases, maintenance of vital statistics, regulation of water supplies and sewage disposal facilities, or sanitation of milk and other food supplies which have been recognized as bona fide public health measures throughout the years. Rather, they are a supplement to or enrichment of those earlier functions.

This expansion of public health interest is not restricted to new fields of activity within the health department, but extends to the programs of other official State agencies as well. For instance, it extends to the problems of hospitalizing the tuberculous and the mentally ill, of arranging for general medical care of the needy, of administering child health programs, or of improving milk and food sanitation, notwithstanding the fact that State agencies other than the health department are often officially responsible for these activities. Consequently, it was believed that no complete picture of health organization at the State level would be possible unless inquiries were extended to include the functions of all State agencies insofar as they touch upon health activity.

Since there was known to be considerable variation among the States in the particular agencies which would contribute to an over-all picture of this type, it was decided that the service rather than the organization should be made the basis of questioning. Thus the information collected would represent the aggregate official State effort toward solving the particular health problem under consideration. Some thirty-five separate categories of activity which are now

recognized as having public health significance were listed for investigation. They are as follows:

Vital statistics
Acute communicable disease control
Tuberculosis control (prevention and treatment—including hospitalization)
Venereal disease control
Maternity hygiene
Infant and preschool hygiene
School health services
Industrial hygiene
Workingmen's compensation
Sanitation of water supplies and sewage disposal facilities
Housing control
Plumbing control
Smoke, fumes, and odors control
Rodent control
Garbage collection and disposal
Shellfish sanitation
Milk sanitation
Malaria control
Pest mosquito control
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public
Food and drug control
Mental hygiene (prevention and treatment—including hospitalization)
Care of crippled children
Cancer control
Prevention and care of blindness
Vocational rehabilitation
Pneumonia control
Hookworm control
Health services for migratory labor
General medical care of the needy
Dental services
Laboratory services
Health education
Research activities
Licensure of professions and agencies significant to the public health

The wide range of interests encompassed by this list is, in itself, representative of the many skeins which go to make up a modern tapestry of total public effort in the interest of human health.

In order that the picture of State health services might be complete, sponsorship of each of the activities listed was followed through the entire structure of State government, regardless of where administrative responsibility had been placed. For instance, acute communicable disease control is primarily a health department function; yet in some States the department of education is the agency charged with certain regulatory aspects of the program when school children are involved. Field service for tuberculosis control is, with few exceptions, a health department responsibility. Hospitalization of

the tuberculous, on the other hand, may be charged to the department of welfare, to a special tuberculosis commission, or to a board of control, of institutions, or of affairs. Industrial hygiene programs are frequently split between the departments of health and labor, the former being responsible for surveys, studies, and recommendations for the improvement of conditions leading to occupational illnesses, and the latter being vested with complete authority for ordering corrections. Food and drug control probably represents the most extreme example of multiple-agency organization, for, when the country as a whole is considered, fifteen separate State agencies either singly or jointly participate in some phase of the States' food and drug activities.

Experimental work in one State showed plainly that because of the overlapping and interweaving of health services provided by the several State agencies, the true comprehensive pattern could not feasibly be obtained through the medium of a mailed questionnaire. It was decided, therefore, that medical officers attached to the district offices of the United States Public Health Service should, through personal interview with the directors of the various health activities, collect the desired information. By this method, individual differences in interpretation of the questions were reduced to a minimum, and description of the exact function of each agency with respect to a specific health problem was facilitated. Participants in collection of the field data are noted at the conclusion of this article.

The schedule used for field work was not designed to elicit the sum total of services *received* by the public, but rather, what the various State organizations *contribute* to those services in terms of regulatory functions, financial grants-in-aid, or direct service programs. In other words, a State agency operates in *one* or a *combination* of the following ways with respect to each of the public health activities being studied: It promulgates rules and regulations; it is a law enforcing body; it provides promotional, supervisory, and/or consultative service to local units; it distributes and/or administers financial grants-in-aid to local units; it conducts educational programs; it renders direct service through staff members of the State central and district offices. Any one or any combination of these approaches may be used by the agency participating in the various health services. Questioning was limited to activity at the State level. No inquiries were made regarding local services even though they were partially or wholly State financed. The State's function in such an arrangement would be described as financial aid to local units, and there the questioning would cease. Consequently, absence of any specific direct service in a State scheme does not necessarily mean that service of that kind is not available. It may, or may not, be provided locally.

Actual field work extended through most of the calendar year 1940. Completed schedules were then forwarded to the Washington office where the editing, tabulating, and interpreting of the material have taken place. In presenting the findings, tabulations followed by brief discussions will be used to show the exact function of each official agency with respect to the health problem under consideration. When direct service programs are operated, the more detailed variations in procedure will also be indicated. A standard method will be used to tabulate the presence or absence of services about which questions were specifically asked in collecting the field data, an assigned code number being used to designate the State agency providing each service. Special treatment in the form of explanatory footnotes will be given modified and additional services which do not fit into the standard tabulation.

The plan for publishing the information gathered differs rather decidedly from that used for the previous editions. Because so many fields of activity are covered in the current survey, relatively few persons would be interested in the bulletin as a whole; consequently, it seemed better to handle the material in a series of discrete articles designed for the special concern of various groups of readers than to incorporate the mass of information in one bulky volume. Furthermore, publication of subject matter for which there are particularly urgent requests can be released as prepared without waiting for completion of the entire job. Reprints of the whole series of articles can then be bound for limited distribution.

The present article represents the first chapter of the complete report and will give a general inclusive picture of health work at the State level, of the official agencies participating in the work, and of the particular activities with which these agencies are identified. It will also deal with approximate gross expenditures for all health activities considered and with the number and professional classification of personnel employed to carry on the aggregate services. Briefly, this first chapter will be factual rather than analytical. Succeeding chapters will feature selected activities and portray in detail the exact manner in which each agency functions with respect to the specific problem under discussion. The following order of presentation is planned:

- Acute communicable disease control
- Tuberculosis control
- Venereal disease control
- Sanitation
  - Water and sewage
  - Other

- Food and drug control
  - General
  - Hotels and restaurants
  - Milk
  - Shellfish
- Medical care
  - General
  - Mental disorders
  - Cancer
  - Crippled children
  - Pneumonia
  - Blindness
- Dental services
- Industrial hygiene and workingmen's compensation
- Maternity-child health activities
- Records and statistics
- Health education
- Laboratory service
  - Diagnostic
  - Research
- Health department organization
- Summary article

With completion of the entire series, a full description will have been given of the distribution of health services in the structure of State government.

Because the health department has major responsibility for a large proportion of State health activities, a special chapter will be devoted to the organization of that agency, with diagrams included to show in a graphic manner existing differences among the States.

DISPERSION OF HEALTH SERVICES AMONG MANY STATE AGENCIES

When one reviews the many interesting findings regarding the total State effort to promote and conserve human health, wide dispersion of functions among multiple State agencies is found to be the most striking. The composite pattern of health activity for the several States includes contributions of State health departments, departments of welfare, agriculture, education, labor, mining, conservation, public utilities, engineering, public safety, State institutions, and registration; of boards of control or boards of affairs; of State universities, independent hospitals, and independent laboratories; of special boards, commissions, or independent offices created especially for a particular activity; and of independent licensing boards.

In all, for the country as a whole, forty-eight separate agencies were listed as participating in one or another of the health activities included in this study. Obviously, a list of this length is too cumbersome for purposes of tabulation or discussion; therefore, some scheme had to be devised for classifying or combining the agencies according to function or type. The fact that terminology represents the primary difference

between a number of the agencies facilitated this course. Even after those having common characteristics were combined, however, there still remain seventeen distinct types of governmental units which are engaged in service having some bearing upon the health of the community. In order that the wide distribution of service might be depicted in tabular form, the several types of agencies have been assigned the following code numbers for purposes of identification:

1. Department of health
2. Department of welfare, social security, emergency relief, general assistance, etc.
3. Department of agriculture
4. Department of labor, labor and industry, labor and immigration, etc.
5. Department of education, public instruction, etc.
6. Special boards, commissions, or independent offices established specifically for the activity indicated (tuberculosis board or commission, cancer commission, workmen's compensation commission or bureau, industrial accident board, dairy and food commission, hotel commission, livestock sanitary board, water resources board, commission for the blind, crippled children's commission, mental disease commission or department, State toxicologist, State veterinarian, etc.)
7. Board of control, board of affairs, department of State institutions, etc.
8. Independent State hospital, independent State laboratory
9. Department of conservation
10. State university or college
11. Department of mines and minerals
12. Department of engineering, department of public utilities
13. State experiment station
14. Independent licensing and examining boards
15. Department of motor vehicles, department of public safety
16. Department of civil service and registration, department of registration and education
17. Other departments or offices of State government

Table 1 shows the extent of the dispersion referred to, both for designated activities and for each State or Territorial jurisdiction. From this table it is possible to identify by code number the types of all official State agencies which participate in some manner in each health activity studied. Attention is called to the use of code number 6 which represents special boards, commissions, or independent offices created especially for a particular activity. This number designates a different agency practically each time it is used within a given State. For instance, when code 6 is entered for industrial hygiene or workingmen's compensation activities it refers to an industrial commission, workmen's compensation commission, or industrial accident board;

when it appears for milk sanitation it stands for a dairy commission, livestock sanitary board, or milk control board; in the field of mental hospitals it represents a special mental disease or mental hospital board, department, or commission; in tuberculosis control the agency indicated is a special tuberculosis commission; and so on, throughout the complete list of activities. In some States there are several special boards or commissions participating in a single health activity. Footnotes are used to indicate this situation.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*

Activity	State or Territory							
	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia
Vital statistics	1	1	1	1	1	1	1	1
Acute communicable disease control	1, 5	1, 8	1, 10	1	1, 10	1, 6	1, 2, 5	1, 5, 17
Tuberculosis control	1	1, 8	1	1	1	1, 6	1	1, 17
Tuberculosis hospitals	1	2	6	1	2	6, 17	1	1, 17
Venereal disease control	1	1, 8	1, 10	1	1, 10	1	1	1, 17
Maternity hygiene	1, 2, 14	1	1, 10	1, 14	1, 10, 14	1	1	1, 16, 17
Infant and preschool hygiene	1, 2	1	1	1, 2	1	1, 2	1	1, 17
School health services	1, 5	1, 5	1, 5	1, 5	1	1, 5	1, 5	1, 5, 17
Industrial hygiene	1, 4	6, 11	-------	1, [e]4	1, 6, 10, 11	1, 4	1, 4, 6	-------
Workingmen's compensation	4	6	-------	[e]4	6	4	6	6
Sanitation of water supplies	1, 5	1, 8	1	1, 4	1, 6	1	1	1, 12, 17
Sanitation of sewage disposal facilities	1	1	1	1, 4	1, 6	1, 6	1	1, 12, 17
Housing control	17	-------	17	4	-------	-------	-------	1, 6, 17
Plumbing control	-------	-------	-------	-------	1	-------	1	1, 12, 17
Smoke, fumes, and odors control	-------	-------	-------	1	[i]6	-------	-------	12, 17
Rodent control	1	-------	-------	1, 3	-------	-------	-------	-------
Garbage collection and disposal	1	-------	-------	1	[h]1	1	1	1, 12, 17
Shellfish sanitation	1	-------	-------	1	-------	1	1	1, 17
Milk sanitation	1, 3, [d]6	6	1, 6	3	1, 3, 6	1, [j]6	1	1, 17
Malaria control	1	-------	1	1	-------	-------	-------	12, 17
Pest mosquito control	1	-------	1	1	-------	13	17	12, 17
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 17	1	1, [d]14	1, 2, 4	1, [d]14	1, 14	1	1, 12, 17
Food and drug control	1, 3	1, 8, 14	1	1, 3, 17	1, 10	1, [d]6, 13	1	1, 17
Mental hygiene (preventive)	-------	1	-------	7	2, 10	1	8	-------
Mental hospitals	6	7	7	7	8, 10	1, 8	8	1, 6
Care of crippled children	5	2	2	1	1, 10	1, 2	1	1
Cancer control	1	-------	1, 10	-------	1, 10	1	-------	-------
Prevention and care of blindness	1, 2, 5	1	1, 2	1, 2	1, 2, 10	1, 6	1	1
Vocational rehabilitation	5	6	5	5	6	5	5	6
Pneumonia control	1	-------	-------	-------	1	1	1	1, 17
Hookworm control	1	-------	1	-------	-------	-------	1	-------
Health services for migratory labor	-------	-------	-------	1, 2, 4	1	-------	4	-------
General medical care of the needy	2	-------	2, 10	2, 10	2, 10	2, 17	-------	1
Dental services	1	-------	1	1	1	1	1	1
Laboratory services	1, 3, 6	8	1	1	1, 10	1, 6	1	1
Health education	1, 4, 5	1, 5	1, 5	1, 5	1	1	1, 5	1, 5, 12
Research activities	1	1	-------	1	1	1	-------	1
Licensure of professions and agencies significant to public health	14	6, 14	14	1, 2, 3, 4, 7, 16	1, 3, 14	1, 14	1, 14	1, 14, 16

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Florida	Georgia	Idaho [a]	Illinois	Indiana	Iowa [b]	Kansas	Kentucky
Vital statistics	1	1	1	1	1	1	1	1
Acute communicable disease control	1, 3, 5	1	1, 2	1	1, 2, 5, 10	1, 10	1	1
Tuberculosis control	1, 2, 5, 6	1	1	1	1, 5, 10	1, 10	1	1
Tuberculosis hospitals	6	1	1	-------	2	7	2	1, 17
Venereal disease control	1, 5, 6	1	1	1	1, 5, 10	1	1	1
Maternity hygiene	1	1	1, 2	1, 16	1, 2, 10	1, 2, 10	1, 2, 10	1
Infant and preschool hygiene	1	1, 2	1	1, 2	1, 2	1, 2	1, 2, 10	1
School health services	1, 5	1, 5	1, 5	1	1, 5	1, 5, 15	1, 5	1, 5
Industrial hygiene	-------	4, 6	1, 6, 11	1, 4, 11	1, 4, 11	1, 4, 11	1, 4	1, 4
Workingmen's compensation	6	6	6	4	4	6	4, 6	6
Sanitation of water supplies	1	1	1	1, 11	1	1	1, 10	1
Sanitation of sewage disposal facilities	1	1	1	1, 6	1	1	1	1
Housing control	-------	-------	-------	6, 17	1, 6, 17	1	-------	-------
Plumbing control	1, 14	-------	-------	-------	1	1	-------	1
Smoke, fumes, and odors control	-------	-------	-------	1	-------	-------	-------	-------
Rodent control	-------	1	-------	-------	-------	-------	1	1
Garbage collection and disposal	1	1	-------	1	1	1	-------	1
Shellfish sanitation	1, 9	(g)	-------	-------	-------	-------	-------	-------
Milk sanitation	1, 3, [d] 6	1, 3, 6	1, 3	1, 3	1, [d] 6	1, 3	1, 3, 6, 10	1, 6
Malaria control	1	1	1	1	1	1, 6	-------	1
Pest mosquito control	1	-------	-------	1	[h] 1	-------	1	-------
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 6, [d] 14	1, 3	1	1, 3, 16	1	1, 3	1, 6	1
Food and drug control	1, 3, 6	3	1, 3	3, 16	1	3, 14	1, 6, 10	1
Mental hygiene (preventive)	-------	2, 6	-------	2, 10	2	2, 6, 7	2	1
Mental hospitals	7	2, 6	2	2	2	7	2	2
Care of crippled children	5, 6	1, 2, 5	1	2, 6, 10, 16	2, 5, 10	10, 15	6	6
Cancer control	-------	1	1	1, 2, 10	1	1, 10	1, 10	-------
Prevention and care of blindness	1, 5	1, 5	1	1, 2, 10, 17	1, 2	1, 2, 5, 6	1, 2, 10	1, 5
Vocational rehabilitation	5	5	1, 6	16	1, 5	6	1	5
Pneumonia control	-------	1	1	1	1	1, 10	1	-------
Hookworm control	1	1	-------	-------	-------	-------	-------	1
Health services for migratory labor	1	-------	-------	-------	-------	-------	-------	-------
General medical care of the needy	-------	-------	-------	[d] 2, 10	2, 5, 10	2, 10	2, 10	-------
Dental services	1	1	-------	1	1, 10	1, 10	1	1
Laboratory services	1, 3	1, 3	1	1, 3, 4	1	1, 3, 10	1, [d] 10	1
Health education	1, 3, 5, [d] 6	1, 2, 3, 4, 5	1	1, 2, 3, 4, 10, 16	1, 2, 5, 10	1, 4, 5, 10	1, 2, 5	1, 5
Research activities	1, 7	1, 3	-------	1, 2, 4, 10	1, 10	1, 10	1, 10	-------
Licensure of professions and agencies significant to public health	1, [d] 6, 14	1, 2, 6, 17	2, 16	1, 2, 16	2, 14	1, 2, 3, 14	2, 3, 6, 14	1, 14

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Louisiana	Maine [a]	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri
Vital statistics	1	1	1	17	1	1	1	1
Acute communicable disease control	1, 5, 8	1	1, 5	1, 3	1	1	1	1
Tuberculosis control	1, 2, 8	1, 7	1, 6	1	1, 6	1, 2	1	1, 7
Tuberculosis hospitals	6, 8	7	6, 17	1, 2	6	2	1	7
Venereal disease control	1, [d]8	1	1	1	1	1	1	1
Maternity hygiene	1, 14	1	1, 10	1, 2	1, 2	1, 2, 10, 14	1	1, 2
Infant and preschool hygiene	1	1, 2	1	1, 2	1, 2	1, 2, 10	1	1, 2
School health services	1, 5	1, 5	1, 5	1, 5	1, 5	1, 5	1, 5	1, 5
Industrial hygiene	4	--------	1, 4, 6	4, 6	1, 4	1, 4	1	1, 4, 6, 11
Workingmen's compensation	--------	4, 6	6	4, 6	4	6	--------	6
Sanitation of water supplies	1	1, 12	1	1, 4	1, 5	1, 6	1	1
Sanitation of sewage disposal facilities	1	1, 12	1	1	1, 5	1, 6	1	1
Housing control	17	--------	--------	6, 15	1, 17	--------	--------	--------
Plumbing control	1	1	1	1, 14	14	1	--------	1
Smoke, fumes, and odors control	--------	1	--------	1, 15	--------	--------	--------	--------
Rodent control	1	--------	--------	--------	--------	[h]6	6	--------
Garbage collection and disposal	1	--------	1	1	1	1	1	--------
Shellfish sanitation	1	3, 13	1, 9	1, 9	--------	--------	1	--------
Milk sanitation	1, [d]6	3, 6, 13	1, 3	1, 3	1, 3, 10	1, 3, 6, 10	1, 6	1, 3
Malaria control	1	--------	--------	--------	--------	1, 10	1	1
Pest mosquito control	1	1	3, 10	1, 3	--------	1, 10	1	--------
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 14	1, 3, 14	1	1, [d]14, 15	1, 2, 3, 4, 14	1, 3, [d]14	1	1
Food and drug control	1	1, 3	1	1, [i]14	1, 3, 14	1, 3, 14	1, 3	1
Mental hygiene (preventive)	[d]8	--------	1, 6	6	6	2, 5, 10	--------	--------
Mental hospitals	[j]8	7	6, 17	6	6	2, 10	7	7
Care of crippled children	1	1, 2	1	1, 2, 5	6	2, 10	5	10
Cancer control	1, [d]8	--------	--------	1	1	1, 10	1, 6	6
Prevention and care of blindness	1, 6, 8	1	1	1, 2, 5	1, 2	1, 2, 10	1, 2	1
Vocational rehabilitation	5	5	5	5	6	5	5	5
Pneumonia control	1	1	1	1	1	1	1	1
Hookworm control	--------	--------	--------	--------	--------	--------	1	--------
Health services for migratory labor	--------	--------	--------	--------	1, 4	1, 2	--------	--------
General medical care of the needy	1, [j]8, 17	2	2, 8, 10, 17	1, 2	2, 10	2, 10	7, 6	--------
Dental services	2	2	1	1	1	1, 2	1	1
Laboratory services	1	1	1	1, 4	1, 3	1, 3	1, 3	1
Health education	1, 5	1, 5	1, 4, 5, 6	1, 4, 5, 16	1, 5, 10	1, 4, 5, 10	1, 5	1
Research activities	1, 14	--------	1	1	1, 10	1, 10	1	1
Licensure of professions and agencies significant to public health	14	1, 2, 14	14	1, 2, 3, 6, 15, 16	1, 2, 3, 14	1, 2, 14	1, 14	1, 2, 14

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina
Vital statistics	1	1	1	1	1	1	1	1
Acute communicable disease control	1, 6	1	1	1	1	1	1, 5	1
Tuberculosis control	1	1, 7	1	1	1, 7	1	1	1, 6
Tuberculosis hospitals	7	7	--------	2, 6	7	2	1	6
Venereal disease control	1	1	1	1	1	1	1	1
Maternity hygiene	1	1, 7	1	1	1, 14	1, 2	1	1, 2
Infant and preschool hygiene	1	1	1	1, 2	1	1, 2	1, 2	1, 2
School health services	1	1	1, 5	1, 5	1, 5	1, 5	1, 5	1, 5
Industrial hygiene	1, 6	4, 6	6, 10, 11	1, 4	4	1, 4, 11	4	1, 4, 6
Workingmen's compensation	6	6	6	4	4	4	4	6
Sanitation of water supplies	1	1	1, 10	1, 5	1, 4	1	1, 4, 5	1
Sanitation of sewage disposal facilities	1	1	1	1, 4, 5	1, 6	1, [d]6	1, 5	1
Housing control	--------	--------	[b] 1	--------	[d] 6	------	6	------
Plumbing control	--------	--------	[b] 1	1	------	------	1	------
Smoke, fumes, and odors control	--------	--------	[b] 1	1	------	---	--------	------
Rodent control	--------	--------	1	------	------	1	--------	1
Garbage collection and disposal	1	------	[b] 1	1	-----	1	1	------
Shellfish sanitation	----	-----	------	1	1	1	1, 9	1, 9
Milk sanitation	[d] 6	3	1, 3	1, 3, 6	1, 3, 6	1, 6	1, 3	1, 3
Malaria control	--------	--------	-----	--------	1, 13	1	--------	1
Pest mosquito control	--------	--------	1	--------	13	------	--------	------
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, [d] 14	1, 3	1, 10, [d]14	1, [d] 14	1, [d] 14	1	1	1
Food and drug control	1, 3, 6	3	1, 10	1, 14	1, 4, 14	1	1, 3, 5	1, 3
Mental hygiene (preventive)	------	------	-------	8	1, 7	---	6	2
Mental hospitals	6, 7	7	7	[d] 8	7	[d] 8	6	8
Care of crippled children	2	7	1, 10	1, 5	6	2	1, 5	1, 8
Cancer control	1	----	------	6	1	---	1, 2	------
Prevention and care of blindness	1, 2	1, 7	1	1, 2	1, 7	1, 2	1, 2, 5	1, 6
Vocational rehabilitation	5	6	6	5	4	6	1, 5	5
Pneumonia control	1	--------	--------	1	1	1	1	------
Hookworm control	--------	--------	--------	--------	------	----	-------	1
Health services for migratory labor	------	--------	--------	1, 4	1	------	1	------
General medical care of the needy	2	------	-------	2	2	2	2	------
Dental services	1	1	1	5	1, 2, 7	-----	1, 2	1
Laboratory services	1, 6	1, 3	1	1, 6	1	1	1, 3, 4, 15	1, 3
Health education	1, 2, 3, 6	1, 3	1	1, 5	1, 5	1	1, 3, 4, 5	1, 5
Research activities	1, 6	--------	--------	--------	1	-----	1, 4	1
Licensure of professions and agencies significant to public health	1, 6, 14	1, 3, 5, 7	14	2, 3, 6, 14	1, 14	1, 14	1, 2, 3, 5, 6	2, 14

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota
Vital statistics	1	1	1	1	1	1	1	1
Acute communicable disease control	1	1, 10	1	1	1	1, 2, 5	1	1
Tuberculosis control	1, 6	1, 2	1	1, 7	1	1	1	1, 10
Tuberculosis hospitals	7	2	7	7, 10	1	1, 17	1	7
Venereal disease control	1	1, 10	1	1	1	1	1	1
Maternity hygiene	1, 2	1, 10, 14	1, 10	1	1, 2, 5	1, 2, 17	1	1
Infant and preschool hygiene	1, 2	1, 2	1	1	1, 2	1, 2	1	1, 2
School health services	1, 5	1, 4, 5	1, 5	1, 5	1, 5	1, 5	1	1, 5
Industrial hygiene	6, 11	1, 4, 6	1, 4, 11	4, 6	1, 4, 11	1, 4	1, 4, 6	------
Workingmen's compensation	6	6	6	6	4	1, 4	6	6
Sanitation of water supplies	1	1	1, 5	1	1	1, 4	1	1
Sanitation of sewage disposal facilities	1	1	1, 6	1, 6	1, 6	1	1	1, 6
Housing control	------	4, 6, 17	17	------	1	------	(g)	------
Plumbing control	[h] 1	1	[h] 1	1	------	------	------	------
Smoke, fumes, and odors control	[h] 1	------	------	------	1	------	------	------
Rodent control	------	------	------	[h] 1	------	------	1	------
Garbage collection and disposal	[h] 1	1	1	1	1	------	------	1
Shellfish sanitation	------	------	------	1	1	1	1	------
Milk sanitation	1, 3, 6, 8	1, 3	1, 3	1, 3, 6	1, 3, 6	1, 3	1, 3, 10	1, 3, 6
Malaria control	------	1	1	1	------	------	1	------
Pest mosquito control	[h] 1	[h] 1	------	1	------	3	1	------
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 8, [d]14	1, 4, [d]14, 17	1, 14	1, 3, 14	1	1	1, 14	1, 3, [d]14
Food and drug control	8	3, 14, 17	1	1, 3, 14	1, 3	1	1, 3	3, 14
Mental hygiene (preventive)	------	2, 5	7	7, 10	2	1, 2, 17	8	------
Mental hospitals	7	2	7	7	2	2, 17	8	7
Care of crippled children	2	2, 5	2, 6, 10	2	1	1, 5, 15	1	1
Cancer control	------	1, 10	------	1, 10	1	1, 2	1	------
Prevention and care of blindness	1, 2	1, 2, 5, 6	1, 7, 10	1, 10	1, 2, 5	1, 2, 5	1	1, 2
Vocational rehabilitation	6	2, 5	5, 6	[d] 6	5	5	5	5
Pneumonia control	1	1	1	------	1	1	------	------
Hookworm control	------	------	1	------	------	------	------	------
Health services for migratory labor	------	------	------	------	------	------	------	------
General medical care of the needy	2	2, 10, 15	7, 10	2	2	2	------	[m] 2
Dental services	1, 2	1, 2, 10	1	(s)	1, 2	1, 2	1	1
Laboratory services	1, 8	1, 3, 10	1	1, 3, 10	1, 3, 4, 14	1, 3	1	1, 10
Health education	1, 5	1, 3, 4, 5, 6	1, 4	1, 3, 5	1, 5	1, 2	1	1
Research activities	------	1, 10	1	------	1	1	1	------
Licensure of professions and agencies significant to public health	2, 3, 8, 14	1, 2, 14	1, 14	1, 3, 14	1, 2, 5	1, 2, 3	14	1, 2, 14

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin
Vital statistics	1	1	1	1	1	1	1	1
Acute communicable disease control	1, 5	1, 5	1, 5	1	1, 3, 5	1, 2	1, 2, 3	1, 5, 10
Tuberculosis control	1, 5	1	1	1, 2	1, 5	1	1, 17	1, 6, 10
Tuberculosis hospitals	1	7	1	2	1	17	2, 7, 17	1
Venereal disease control	1	1	1	1	1	1, 2	1, 2, 7	1, 2, 10
Maternity hygiene	1	1	1, 16	1	1, 2	1	1, 2	1, 2, 10, 14
Infant and preschool hygiene	1	1, 2	1	1, 2	1, 2, 5	1	1, 2	1, 2
School health services	--------	1, 5	1, 5	1, 5	1, 5	5	1, 5	1, 5, 6
Industrial hygiene	1, 4	1, 4	1, 6	1, 6	1, 4	1, 4	1, 4, 6, 11	1, 6
Workingmen's compensation	4	6	6	6	4, 6	4	6	6
Sanitation of water supplies	1	1	1	1	1, 3, 5	1, 2, 4, 6	1	1
Sanitation of sewage disposal facilities	1	1	1	1	1, 3	1, [d] 6	1, 6	1, 6
Housing control	--------	1, 6	--------	--------	1, 6	--------	--------	6
Plumbing control	--------	[h] 1	14	1	1, 4	--------	--------	1
Smoke, fumes, and odors control	--------	--------	--------	--------	--------	1, 3, 4	--------	1
Rodent control	--------	1	--------	--------	--------	--------	--------	[h] 1, [h] 3
Garbage collection and disposal	--------	1	--------	--------	--------	1	--------	1
Shellfish sanitation	--------	1, 6	--------	--------	1, 3	1	--------	--------
Milk sanitation	1, 3	1, 6	3	1, 3	1, 3	1, 3, 6	1, 3	1, 3
Malaria control	1	1	--------	--------	1, 5	--------	--------	1
Pest mosquito control	--------	1	--------	--------	1	--------	--------	1
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 4, 9, 14	1, [d] 14	[k] 1	1, [d] 14	1, 3	1, 2, 3	1	1
Food and drug control	3, 9	1	3, 16	1	1, 3	1, 3	1, 3, 14	1, 3, 14
Mental hygiene (preventive)	1	1	--------	2	2	1	1, 2, 7	2, 10
Mental hospitals	7	7	[d] 8	2, 6	6	17	2, 7	2
Care of crippled children	1	5	1	1	1, 2, 5	2	2, 5	5, 10
Cancer control	--------	1	--------	1, 6	--------	1	--------	1, 10
Prevention and care of blindness	1, 2	1	1, 2	1	1, 5, 6	1, 2	1, 2	1, 5, 10
Vocational rehabilitation	5	5	5	1, 5	5, 6	6	2, 5	1, 6
Pneumonia control	1	1	1	1	1	1	--------	1
Hookworm control	--------	--------	--------	--------	--------	--------	--------	--------
Health services for migratory labor	--------	1	--------	--------	--------	--------	--------	1, 2
General medical care of the needy	--------	10	--------	2	2, 10	2	2, 6, 7	2, 10
Dental services	1	1	1	1	1	([g])	1, 2	1, 2
Laboratory services	1, 3	1, 15	1, 6	1, 3	1, 3	1, 6	1	1, 3, 10
Health education	1, 3, 5, 10	1	1	1, 5	1, 5	1	1, 2, 3, 5	1, 3
Research activities	--------	1	--------	--------	1	--------	1	1, 10
Licensure of professions and agencies significant to public health	3, 14	1, 2, 14	1, 16	1, 2, 3, 14	2, 14	3, 10	1, 14	1, 2, 14

See footnotes at end of table.

TABLE 1.—*Department of State government* responsible for specific health activities in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory				
	Wyoming	Alaska	Hawaii	Puerto Rico	Virgin Islands
Vital statistics	1	[c] 1, 17	1	1	1
Acute communicable disease control	1	1	1	1, 5, 17	1, 17
Tuberculosis control	1	1	1	1	1, 17
Tuberculosis hospitals	7	2	1	1	---------
Venereal disease control	1	1	1	1	1
Maternity hygiene	1, 14	1, 2	1	1	1
Infant and preschool hygiene	1	1	1	1	1
School health services	1, 5	1, 5	1, 5	1, 5	1
Industrial hygiene	4, 11	11	1	1, 4	---------
Workingmen's compensation	6	(f)	4	6	2
Sanitation of water supplies	1	1	1	1	1
Sanitation of sewage disposal facilities	1	1	1	1	1
Housing control	---------	1	1	1	17
Plumbing control	---------	1	1	1	17
Smoke, fumes, and odors control	---------	---------	1	1, 12	---------
Rodent control	1	---------	1	1	---------
Garbage collection and disposal	[h] 1	1	1	1	1, 17
Shellfish sanitation	---------	1	---------	---------	---------
Milk sanitation	3, [d] 6	1	1	1	1
Malaria control	---------	---------	1	1	1
Pest mosquito control	---------	---------	1	1	1
Supervision of hotels, restaurants, tourist camps, and other facilities for the traveling public	1, 3, 14	1	1	1	---------
Food and drug control	3, 6	---------	1	1	---------
Mental hygiene (preventive)	---------	---------	1	6	---------
Mental hospitals	7	---------	1, 7	1	1
Care of crippled children	1	1	1, 5	1	---------
Cancer control	---------	---------	1	---------	---------
Prevention and care of blindness	1, 5	1	1, 2, 5	1	1
Vocational rehabilitation	5	---------	5	---------	---------
Pneumonia control	1	1	1	---------	---------
Hookworm control	---------	---------	---------	1	1
Health services for migratory labor	---------	---------	---------	---------	---------
General medical care of the needy	---------	2	1, 8	1	1
Dental services	1	1, 2	5	1	1
Laboratory services	1, 6	1	1	1	1
Health education	1, 5	1, 5	1, 5	1	5
Research activities	---------	1	1	1	---------
Licensure of professions and agencies significant to public health	14	1, 14	1, 2, 14	1, 14	---------

*Code:
1. Department of health.
2. Department of welfare, social security, emergency relief, general assistance, etc.
3. Department of agriculture.
4. Department of labor, labor and industry, labor and immigration, etc.
5. Department of education, public instruction, etc.
6. Special boards, commissions, or independent offices established specifically for the activity indicated (tuberculosis board or commission, cancer commission, workmen's compensation commission or bureau, industrial accident board, dairy and food commission, hotel commission, livestock sanitary board, water resources board, commission for the blind, crippled children's commission, mental disease commission or department, State toxicologist, State veterinarian, etc.).
7. Board of control, board of affairs, department of State institutions, etc.
8. Independent State hospital, independent State laboratory.
9. Department of conservation.
10. State university or college.
11. Department of mines and minerals.
12. Department of engineering, department of public utilities.
13. State experiment station.
14. Independent licensing and examining boards.
15. Department of motor vehicles, department of public safety.
16. Department of civil service and registration, department of registration and education.
17. Other departments or offices of State government.

[a] The department of health is really a division (Idaho) and bureau (Maine) of public health, subordinate to the department of public welfare (Idaho) and the department of health and welfare (Maine).

[b] The State University of Iowa is administered by a board of education which is independent of the regular department of public instruction.

[c] Grant-in-aid to the Territorial auditor only.

[d] Two separate agencies of this classification participate in this activity.

[e] By the industrial accident commission, an autonomous unit within the department of industrial relations.

[f] Through courts only—no administrative agency.

[g] Temporarily no activity.

[h] Advisory service only.

[i] Regulatory authority only—no real program.

[j] Three separate agencies of this classification participate in this activity.

[k] Swimming pools only.

[l] Four separate agencies of this classification participate in this activity.

[m] Medicines only

Realization that within a single State as many as 18 separate agencies contribute something to the health activities covered is somewhat startling. In no jurisdiction are less than 6 agencies involved, and the median number of departments, boards, and commissions concerned with programs having public health significance is 11 per State. When dispersion is viewed from the point of specific activity among all the States, the situation is quite as remarkable. Records for a few activities are cited. For the Nation as a whole, 15 different types of State organizations participate in food and drug control work; 11 are engaged in sanitation of water supplies; 11 touch upon the problem of general medical care of the needy. The latter statement, by the way, represents only about three-fourths of the areas included because 14 States make no provision for service of this type. Hospitalization of the tuberculous is the product of 9 different types of State agencies and hospitalization of mental patients, of 7. Mental hygiene, a relatively new entrant into public health awareness, is split among 9 separate organizations in the 17 States which have initiated such activities.

It should be stated at this point that the participating agencies rarely share responsibility on an equal basis for either complete or partial programs. In this first chapter no distinction is made between agencies having major responsibility and those functioning in a supplementary capacity. The more detailed analyses will be reserved for later discussions of the series which will feature separate activities. Nevertheless, a general statement regarding differences in extent of the several programs is appropriate at this time.

In magnitude, programs cover the entire range from regulatory functions only or advisory service only—and that limited to requests—to operation of complex direct service units. From the standpoint of organizational schemes, greatest variation exists among the States in their conception of the portion of responsibility to be borne by the State agency and the portion to be delegated to local jurisdictions. In one place it is the policy to limit State assistance to advice, supervision, or promotion. In another, the State agency actively engages in direct service. In still another, the first plan is followed for some activities and the second plan for others. Distribution of financial aid for approved projects is also a form of State participation now in common use. The exact function of each agency with regard to the several activities listed will be described in successive articles devoted to the respective health interests.

Expansion of old and development of new programs are the criteria selected for judging progress in organization of health activities.

Inasmuch as comparative details will be more adequately presented in later articles, it is fitting at this point merely to generalize from the data and say that for the health departments proper, the past decade has shown marked growth and improvement in organization. For the other numerous State agencies engaged in one or more phases of public health work, there is no basis for comparing the present situation with that of ten years ago. However, with few exceptions, greater emphasis is placed upon the public health aspects of any of the problems included in this survey when the health department is the controlling agency than when some other agency is primarily responsible.

APPROXIMATE EXPENDITURES FOR OFFICIAL STATE HEALTH SERVICES

After tracing throughout the entire structure of State government the scope of all official activities for the promotion of health, an effort was made to determine the cost of such services. That no absolutely complete and accurate figure is available or ascertainable for the aggregate health services described in the foregoing section of this report was soon apparent. Explanation of the difficulty in arriving at such a figure is simple. Those agencies which carry on health work subordinately to or coordinately with other activities irrelevant to this study are not apt to keep their records in a fashion which permits separating precise expenditure figures for health work from expenditures for other types of services. In the absence of exact records, estimates or approximations by the director in charge were requested. Therefore, all financial data must be regarded as representing index instead of absolute amounts. Minimum rather than maximum expenditures are indicated since sometimes, because of overlapping and interweaving of activities, it was impossible even to secure estimates. The health aspects of workingmen's compensation and vocational rehabilitation activities are excellent examples of this situation. Naturally, however, the complete list of items for which fiscal information was not available varies among the several States.

Nevertheless, in spite of the qualifications noted, it is believed that the expenditure figure finally obtained is more complete than that provided by any previous survey. According to table 2, a total of over 285 million dollars was reported as an annual expenditure by the forty-eight States, the District of Columbia, the Territories of Alaska, Hawaii, and Puerto Rico, and the Virgin Islands for the sum total of State-operated health activities under discussion. The amount expended by each jurisdiction and the resulting per capita cost may be determined from the same tabulation.

402840°—41——2

TABLE 2.—*Approximate total and per capita annual expenditures* by all official State agencies for health activities, and proportion of the total amount which was expended by agencies of each specified type*

State or Territory	Approximate total annual expenditure* by all official State agencies for health activities	Approximate per capita annual expenditure* by all official State agencies for health activities	Percent of total** expended by each agency: Health department	Special boards or commissions	Department of welfare	Board of control	Independent State hospitals, laboratories, etc.	Department of labor	State university or college	Department of agriculture	All other agencies of State government
Total	$285, 715, 800	$1.90	18.5	25.0	21 3	16.0	5.4	3.2	3.2	2.3	5.1
Alabama	2, 668, 900	.94	42 9	45.2	(a)			1.1		2.9	7 9
Arizona	1, 130, 500	2.26	15.6	34 3	14.0	30.6	1.0				4.5
Arkansas	2, 721, 000	1.40	23.6	23.9	8.7	33.4			8.5		1.9
California	14, 096, 400	2.04	17.4		.2	49.9		20 4	7.2	1.6	3.3
Colorado	2, 752, 600	2.45	16.8	.5	13.1		42 0		23.1	.3	4.2
Connecticut	6, 007, 200	3.51	9.3	31.1	1.5		40 3	1.2			7.6
Delaware	1, 076, 100	4.04	41.7	(a)	(a)		55.2	(a)			3.1
District of Columbia	6, 608, 800	10.44	40.2	1.4							58.4
Florida	3, 109, 900	1.64	17.7	22.0	(a)	53.1				3.8	3.4
Georgia	2, 964, 200	.95	38 7	(a)	55.4			.8		4.9	.2
Idaho	986, 000	1.88	25.7	[b] 23.3	37 1					12.2	1.7
Illinois	17, 678, 000	2.24	8.7	.2	[c] 80 0			1.2	(d)	4.6	5.3
Indiana	7, 332, 800	2.14	9 1	1.6	76.4			(a)	10.2		2.7
Iowa	4, 780, 300	1.88	10.0	[b] .4	[b] .4	47.9		.2	34.0	4.7	2.4
Kansas	3, 008, 400	1.67	13.5	9 7	72.2			.8	(a)	1.0	2.8
Kentucky	2, 522, 500	.89	40.1	8.6	47.3			(a)			4.0
Louisiana	5, 754, 200	2.43	17.9	3.5	(a)		76.2	0.1			2.3
Maine	2, 023, 900	2.39	18.3	.5	[b] 9.5	61.7		(a)		7.8	2.2
Maryland	4, 102, 000	2.25	18.0	48.5	.1		.7	.8	15.9	.5	14.9
Massachusetts	13, 781, 200	3 19	27.5	52.2	[b] 12.8			1.4		3.3	2.8
Michigan	12, 439, 100	2 37	10.5	80 4	[b] .2			(e, b)	6 2	1.5	1.2
Minnesota	6, 148, 500	2.20	11.3	2.4	66.9			.7	15.5	1.4	1.8
Mississippi	2, 143, 900	.98	42 4	[b] 11.6	.5	41.2				(d)	4 3
Missouri	5, 058, 400	1.34	14.2	(a)	.1	70.3		.6	2.7	.8	2.3
Montana	1, 472, 700	2.63	11.4	25.9	11.7	46.9				1.9	2.2
Nebraska	1, 724, 700	1.31	9.1	(a)		82.3		.9		7.7	
Nevada	469, 200	4.26	21.9	51.3		17.9			1.8	1.6	5.5
New Hampshire	1, 637, 400	3.33	12.7	8.9	9.5		61.5	6		5.1	1.7
New Jersey	10, 875, 900	2.61	8.3	3.4	6.7	76.8		1.5		1.3	2.0
New Mexico	690, 000	1.30	32 2	(a)	[b] 19 0		40.8				8.0
New York	44, 054, 800	3.27	15 9	78.6	(a)			2.1		2.1	1.3
North Carolina	3, 260, 400	.91	36.3	14.1	.6		45 1	.1		[b] 1.6	2.2
North Dakota	2, 090, 900	3.26	8.4	13 3	16.4	56.5	2.8			1.0	1.6
Ohio	12, 932, 800	1.87	7.2	31.1	51.2			1.9	[b] 3.6	1.7	3.3
Oklahoma	3, 470, 300	1.49	15.6	6.0	(f)	54 8		.4	20.4	(a)	2 8
Oregon	3, 119, 600	2.86	9 1	[b] 33.8	[b] 3.7	45.7		1.1	[b] 1.4	2.9	2.3
Pennsylvania	26, 098, 000	2.64	14.2	1.0	65 2			12.4		4.9	2.3
Rhode Island	2, 355, 300	3.30	33.7	1.4	60.2			.9		2.1	1.7
South Carolina	3, 523, 800	1.85	25.1	(a)			71.9	.9	1.2	(a)	.9
South Dakota	1, 359, 400	2.11	15.1	2.6	13.4	62.9			1.9	2.0	2 1
Tennessee	2, 228, 500	.76	50.8		(a)	44.2		(d)	(a)	[b] 2.2	2.8
Texas	5, 512, 600	.86	20.5	(a)	(a)	70.3		(a)			9.2
Utah	1, 401, 400	2.55	31.8	28.1	.9		34.4			3.4	1.4
Vermont	889, 700	2.48	20.4	16.4	57.3					3.8	2.1
Virginia	4, 392, 700	1.64	42.6	[b] 52.5	2.7			.5	(a)	1.4	.3
Washington	3, 818, 900	2.20	7.5	[b] .1	[b] 2.6			[b] 20.2		4.3	65.3
West Virginia	3, 781, 000	1.99	10.4	17.8	21 9	39.1		1.3		1.7	7.8
Wisconsin	7, 092, 400	2.26	9.1	1.7	2.9	[g] 60.2			17.0	5.5	3.6
Wyoming	569, 500	2.27	19.2	22.7		48.9		.9		2.0	6.3
Alaska	182, 900	2.51	93.6		(a)						6.4
Hawaii	2, 129, 900	5.03	52.4		2.3	19.9	22.6				2.8
Puerto Rico	3, 534, 200	1.89	99.2	.8				(a)			
Virgin Islands	151, 500	6.09	96.4		(a)						3.6

*Expenditures for the health services considered represent index rather than absolute amounts. Because of variations in fiscal practices, figures cover the most recent year for which information was available at the date of interview. In some instances, estimates were accepted in the absence of precise expenditure records; in others, it was impossible to secure even an estimate.

**Percentage distribution is based upon the expenditure information reported for each agency even though that amount might be incomplete.

[a] Information not available.

[b] Information incomplete.

[c] Represents expenditures of two separate agencies of this classification.

[d] Units of the University of Illinois rendering service included here operate jointly with the department of welfare and are financed by that agency.

[e] Less than one-tenth of 1 percent.

[f] Financial grant-in-aid to the crippled children's commission for administration. Figure included in expenditure of that agency.

[g] The board of control no longer functions in Wisconsin. Operation of tuberculosis hospitals has been transferred to the State health department and operation of mental hospitals is now a function of the department of public welfare. However, records for a complete fiscal year were not available under the new administrative set-up.

The extremely wide range in annual per capita expenditures by State governments for health activities which could be segregated as such is manifest from Tennessee's $0.76 and Nevada's $4.26. This contrast is drawn for the forty-eight States only, inasmuch as situations found in the District of Columbia, the Territories, and island possessions do not characterize true State organization. The average figure for the country as a whole is $1.90, while the median is $2.20. Differences in expenditures for State health services appear to be conditioned largely by the State's ability to purchase service, for when States are arranged according to per capita expenditures for all State health activities and compared with a corresponding array by wealth,[1] two-thirds of them fall within the same quarterly divisions. Another extremely important consideration, naturally, is difference in the amount of central and local responsibility. Low expenditure by State agencies does not necessarily represent a deficiency, since it may be complemented by high local expenditure.

Probably the most striking disclosure of table 2 is the fact that, for the country as a whole, State health departments, agencies established solely for health work, spend less than one-fifth of the total amount devoted to aggregate health activities by all State agencies. Indeed, health expenditures of both special boards and commissions set up for specific problems and of State departments of welfare exceed those of State health departments, while expenditures of boards of control closely approach those of the health departments. This situation appears to result from the relatively infrequent inclusion of hospitalization (one of the most expensive health services) in State health department programs as contrasted with the more general provision of hospital care by separate agencies with particular interests, by departments of welfare, and by boards of control.

Actually, the difference between expenditures of health departments and of special boards and commissions and departments of welfare is probably even more pronounced than table 2 indicates, for the health department expenditures reported are believed to be complete, whereas it was impossible to obtain the cost of all health activities engaged in by agencies of the other two types. For example, in a number of States financial grants-in-aid by State welfare departments to counties for general medical care of the needy were one particular item which would not be separated from expenditures for general relief—a service not significant to this study.

[1] Martin, John L, National Income Division, Department of Commerce Income Payments to Individuals by States, 1929-39 Survey of Current Business, October 1940.

Such is the composite State health scene for the several jurisdictions. As might be suspected from the earlier discussion of diversity in organization for State health work, extreme variation characterizes the pattern when individual States are studied with regard to types of agencies responsible for financing the health activities under consideration. The health department is the only type of agency listed which participates in some way in every State. However, the proportion of the total expense which is borne by the health department is smaller than might be expected in most instances. True, more than 90 percent of the total amount allotted to health work is administered by the health department in Alaska, Puerto Rico, and the Virgin Islands, but these jurisdictions do not represent true States. In only one-third of the States does the health department spend more than 25 percent of the total sum, and in one-fourth of them not more than 10 percent is charged to this agency.

No participation by the department of welfare is recorded for six States, and for nine, which do participate, no estimate of expenditures for health services could be obtained. For the remaining States, the portion of the total financial burden which is borne by the department of welfare extends from one-tenth of 1 percent to 80 percent. Practically the same range obtains for the special boards and commissions. However, expenditures of one or more agencies of this category are recorded for all but five States.

Boards of control and State hospitals administered by independent boards of managers operate in only about two-fifths and one-fourth of the States, respectively. In these particular States, however, they are responsible for a considerable portion of the total health expenditures. Half of the boards of control account for as much as 50 percent of their States' aggregate health expenses, while expenditures of half the independent State hospitals reach 42 percent of the grand total. In general, the departments of labor and agriculture spend relatively small sums per State for health work, but participate in small measure in many places. Health services of State universities, on the other hand, are confined to fewer States, but where provided they are apt to represent an appreciable part of the entire bill for health work.

Untabulated material confirms what is suggested by table 2, namely, that preventive health activities still receive relatively less emphasis from official agencies than do corrective and custodial services.

State, local, and Federal appropriating bodies contribute to the general fund for health work of State agencies, while license fees and insurance fees collected under State authority are depended upon to

support several of the services discussed. From table 3 may be determined the proportion of all money expended which was derived from each source and the variation of this distribution from State to State.

TABLE 3.—*Approximate total and per capita annual expenditures* by all official State agencies for health activities, and proportion of the total amount which was derived from each specified source*

State or Territory	Approximate total annual expenditure* by all official State agencies for health activities	Approximate per capita annual expenditure* by all official State agencies for health activities	Percent of total derived from each source					
			State	Local	U. S. Public Health Service Title VI	U. S. Public Health Service V. D. funds	U. S. Children's Bureau Title V	Other
Total	$285,715,800	$1.90	81.4	3.9	3.2	1.0	2.5	8.0
Alabama	2,668,900	.94	66.6	-------	11.0	5.3	8.9	8.2
Arizona	1,130,500	2.26	53.8	-------	4.9	1.2	8.3	31.8
Arkansas	2,721,000	1.40	80.4	-------	8.2	3.7	5.5	2.2
California	14,096,400	2.04	62.7	7.9	2.2	1.2	1.8	24.2
Colorado	2,752,600	2.45	62.2	9.3	4.5	1.2	4.8	18.0
Connecticut	6,007,200	3.51	72.6	13.0	1.7	.4	1.2	11.1
Delaware	1,076,100	4.04	83.1	-------	4.0	.5	4.6	7.8
District of Columbia	6,608,800	10.44	97.3	-------	1.0	.1	1.6	-------
Florida	3,109,000	1.64	73.7	3.4	4.4	1.0	4.4	13.1
Georgia	2,964,200	.95	78.8	.1	9.9	2.0	7.1	2.1
Idaho	986,000	1.88	49.3	2.1	7.4	1.4	7.0	32.8
Illinois	17,678,000	2.24	93.9	-------	2.4	.6	1.9	1.2
Indiana	7,332,800	2.14	93.4	1.7	2.7	.7	1.5	-------
Iowa	4,780,300	1.88	49.6	31.5	3.8	.9	2.4	11.8
Kansas	3,008,400	1.67	74.3	4.7	4.5	1.8	4.2	10.5
Kentucky	2,522,500	.89	75.3	-------	9.0	2.2	7.4	6.1
Louisiana	5,754,200	2.43	93.8	-------	3.0	.6	1.7	.9
Maine	2,023,900	2.39	85.0	1.0	3.2	.4	4.5	5.9
Maryland	4,102,000	2.25	72.9	.8	3.2	.6	4.1	18.4
Massachusetts	13,781,200	3.19	95.7	-------	1.6	.4	1.3	1.0
Michigan	12,439,100	2.37	87.3	6.1	2.2	.9	1.4	2.1
Minnesota	6,148,500	2.20	73.5	11.4	3.2	.5	2.4	9.0
Mississippi	2,143,900	.98	75.8	-------	10.0	4.3	6.5	3.4
Missouri	5,058,400	1.34	88.7	.7	5.4	1.5	2.1	1.6
Montana	1,472,700	2.63	53.2	6.3	3.9	.2	5.6	30.8
Nebraska	1,724,700	1.31	72.2	9.7	3.3	.5	4.4	9.9
Nevada	469,200	4.26	31.3	2.3	6.7	.7	7.0	52.0
New Hampshire	1,637,400	3.33	84.5	.9	3.1	.7	3.4	7.4
New Jersey	10,875,900	2.61	67.2	23.1	1.9	.6	1.8	5.4
New Mexico	690,000	1.30	64.0	-------	10.4	1.3	17.5	6.8
New York	44,051,800	3.27	97.6	-------	1.3	.4	.7	(a)
North Carolina	3,260,400	.91	68.0	-------	9.6	1.6	7.3	13.5
North Dakota	2,090,900	3.26	30.7	47.2	2.9	.1	4.8	14.3
Ohio	12,932,800	1.87	63.2	.3	2.4	1.0	1.5	31.6
Oklahoma	3,470,300	1.49	82.7	2.7	5.4	2.6	3.3	3.3
Oregon	3,119,600	2.80	58.2	-------	2.0	1.0	4.1	33.8
Pennsylvania	26,098,000	2.64	85.9	-------	1.5	.5	1.1	11.0
Rhode Island	2,355,300	3.30	93.2	-------	2.3	.4	2.2	1.9
South Carolina	3,523,800	1.85	87.0	.6	5.5	1.5	4.5	.9
South Dakota	1,359,400	2.11	77.4	-------	5.4	.5	5.0	11.7
Tennessee	2,228,500	.76	63.4	4.6	13.6	3.0	7.6	7.8
Texas	5,512,600	.86	80.6	-------	7.6	4.7	6.4	.7
Utah	1,401,400	2.55	58.9	2.5	4.8	1.0	6.2	26.6
Vermont	889,700	2.48	85.8	.7	4.8	.1	6.1	2.5
Virginia	4,392,700	1.64	81.0	7.0	5.8	2.4	3.6	.2
Washington	3,818,900	2.20	73.0	.6	2.8	1.1	2.2	20.3
West Virginia	3,781,600	1.99	73.0	.5	3.9	.6	3.2	18.8
Wisconsin	7,092,400	2.26	71.9	17.0	2.3	.3	1.9	6.6
Wyoming	569,500	2.27	67.5	(a)	4.8	.3	7.0	20.4
Alaska	182,900	2.51	22.6	13.4	22.2	1.1	38.1	2.6
Hawaii	2,129,900	5.03	91.9	.5	2.7	.6	2.9	1.4
Puerto Rico	3,534,200	1.89	81.8	-------	7.4	3.4	7.4	-------
Virgin Islands	151,500	6.09	86.1	-------	11.4	2.5	-------	-------

*Expenditures for the health services considered represent index rather than absolute amounts. Because of variations in fiscal practices, figures cover the most recent year for which information was available at the date of interview. In some instances, because of overlapping and interweaving of activities, estimates were accepted in the absence of precise expenditure records; in others, it was impossible to secure even an estimate.
a Less than one-tenth of 1 percent.

It must be borne in mind constantly that the data herewith presented pertain only to health activities of official State agencies as measured by regulatory functions, promotional, educational, and supervisory work, financial grants-in-aid to local units, and direct service programs. They do not include the services of local units. Local money recorded in table 3 represents contributions of counties, cities, or townships to service provided directly by State agencies.

For the country as a whole, about four-fifths of the entire sum expended for State activities which have a direct bearing upon human health is appropriated by the State. Monies collected as special fees and donations by voluntary organizations constitute 8 percent of the aggregate expenditures; 7 percent of the total amount represents grants-in-aid from Federal governmental agencies; and the remaining 4 percent is made up of assessments from local political subdivisions. This break-down is not constant for all States, of course. In one State, for example, one-half of the total amount expended is derived from special fees, assessments, or premiums levied on selected occupational groups. In three others, conversely, financial participation from other than State tax sources is relatively negligible, being less than 5 percent of the total.

ADMINISTRATIVE AND FIELD PERSONNEL ENGAGED IN OFFICIAL STATE HEALTH SERVICES

Full-time administrative and field personnel engaged in carrying out the health programs of the various State agencies number 18,737. It should be stated at this point that efforts of personnel recorded in the accompanying tables (tables 4 and 5) are supplemented by work of additional persons who spend only part of their time on health work. Because of the variability of part-time employment, however, it has not been considered practicable to include other than full-time personnel. Institutional employees have been omitted from the count likewise, because the data at hand in central State offices are not susceptible to break-down by classification or by description of duties. Moreover, examination of the internal administration of institutions is not within the province of this study.

TABLE 4.—*Full-time administrative and field personnel employed by official State agencies of different types for health activities*

State or Territory	Number of persons employed full time for health work by State agencies of each type									
	All agencies of State government	Health department	Special boards or commissions	Department of welfare	Board of control	Independent State hospitals, laboratories, etc.	Department of labor	State university or college	Department of agriculture	All other agencies of State government
Total	18,737	11,269	1,070	617	106	80	1,086	90	1,496	2,923
Alabama	313	232	7	(a)	-------	-------	15	-------	33	26
Arizona	77	31	7	13	(a)	11	-------	-------	-------	15
Arkansas	98	67	4	17	(a)	-------	-------	(a)	-------	10
California	637	374	-------	12	(a)	-------	88	(a)	57	106
Colorado	160	110	8	2	-------	(a)	-------	(a)	(a)	40
Connecticut	282	174	65	(a)	-------	(a)	30	-------	-------	13
Delaware	97	64	(a)	(a)	-------	(a)	(a)	-------	-------	33
District of Columbia	1,864	302	77	-------	-------	-------	-------	-------	-------	1,485
Florida	279	195	77	(a)	5	-------	-------	-------	(a)	2
Georgia	294	195	(a)	17	-------	-------	7	-------	73	2
Idaho	46	36	(a)	2	-------	-------	-------	-------	5	3
Illinois	1,012	480	8	131	-------	-------	75	(a)	170	148
Indiana	398	223	30	49	-------	-------	15	(a)	-------	81
Iowa	288	168	(a)	11	3	-------	3	(a)	56	47
Kansas	162	95	31	7	-------	-------	11	(a)	11	7
Kentucky	231	187	7	6	-------	-------	(a)	-------	-------	31
Louisiana	559	470	12	(a)	-------	34	2	-------	-------	41
Maine	159	127	3	(a)	4	-------	(a)	-------	18	7
Maryland	178	135	6	2	-------	(a)	19	(a)	12	4
Massachusetts	893	420	146	(a)	-------	-------	71	-------	99	157
Michigan	555	377	41	8	-------	-------	3	(a)	69	57
Minnesota	470	272	32	70	-------	-------	26	7	37	26
Mississippi	140	123	4	3	(a)	-------	-------	-------	(a)	10
Missouri	309	230	3	2	12	-------	11	11	13	27
Montana	76	43	14	5	1	-------	-------	-------	7	6
Nebraska	102	55	(a)	-------	7	-------	6	-------	34	-------
Nevada	58	35	(a)	-------	3	-------	-------	5	11	4
New Hampshire	96	70	6	(a)	-------	(a)	4	-------	15	1
New Jersey	548	315	61	(a)	25	-------	88	-------	18	41
New Mexico	65	51	(a)	11	-------	(a)	-------	-------	-------	3
New York	1,973	1,282	103	12	-------	-------	358	-------	174	44
North Carolina	203	185	(a)	5	-------	(a)	1	-------	12	(a)
North Dakota	106	53	4	14	(a)	22	-------	-------	7	6
Ohio	470	153	87	70	-------	-------	(a)	(a)	54	106
Oklahoma	208	132	26	(a)	26	-------	11	(a)	(a)	13
Oregon	157	60	15	10	1	-------	12	4	35	20
Pennsylvania	1,587	1,013	79	23	-------	-------	162	-------	208	102
Rhode Island	170	118	15	16	-------	-------	5	-------	16	(a)
South Carolina	157	126	2	-------	-------	(a)	16	13	(a)	(a)
South Dakota	80	41	5	(a)	(a)	-------	-------	17	11	6
Tennessee	321	284	-------	(a)	(a)	-------	(a)	(a)	21	16
Texas	376	351	(a)	(a)	3	-------	(a)	-------	-------	22
Utah	154	130	9	1	-------	(a)	-------	-------	8	6
Vermont	100	74	15	(a)	-------	-------	-------	-------	7	4
Virginia	433	392	8	6	-------	-------	8	(a)	17	2
Washington	177	64	1	12	-------	-------	27	-------	59	14
West Virginia	236	81	1	49	14	-------	9	-------	24	58
Wisconsin	415	201	35	22	(b)	-------	-------	33	102	22
Wyoming	55	34	6	-------	2	-------	3	-------	3	7
Alaska	31	28	-------	(a)	-------	-------	-------	-------	-------	3
Hawaii	314	261	-------	9	(a)	13	-------	-------	-------	31
Puerto Rico	508	498	10	-------	-------	-------	(a)	-------	-------	-------
Virgin Islands	60	52	-------	(a)	-------	-------	-------	-------	-------	8

[a] Part-time or institutional personnel only.

[b] The board of control no longer functions in Wisconsin. Operation of tuberculosis hospitals has been transferred to the State health department and operation of mental hospitals is now a function of the department of public welfare. However, records for a complete fiscal year were not available under the new administrative set-up.

Health departments employ by far the greatest personnel body—about three-fifths of the total. Additional agencies which account for over 1,000 persons each are the department of agriculture, the department of labor, special boards or commissions, and agencies grouped under the designation "Other." Exclusion of part-time and institutional personnel is partly responsible, of course, for the relatively high ranking of health departments with respect to the number of persons employed, as health work is the sole function of such organizations and apt to receive the full-time attention of most staff members. On the other hand, it is often only an incidental feature of the programs of other types of State agencies, thus making it impossible to convert the part-time health activities of many employees into the equivalent of full-time employment. In view of this situation, double interest is attached to the fact that nearly 7,500 persons associated with State agencies other than health departments devote all of their time to work which has bearing of one kind or another upon the public health.

The personnel picture is not complete without some consideration of the professional classification of those who participate in the health activities covered by this survey. Table 5 presents this classification for all jurisdictions studied. For the country as a whole, clerical and records personnel head the list in point of number employed; inspectors of various sorts (environmental sanitation, food and drug, hotel and restaurant, milk, plumbing, factory, and mine inspectors) follow; and those designated as "Other and unclassified" rank third. Among others, this group includes educators, nutritionists, social workers, attorneys, pharmacists, psychologists, veterinarians, draftsmen, entomologists, chauffeurs, and messengers, all of whom perform some type of duties related to health.

A relatively large number of laborers is employed also. The total for this classification of workers is markedly influenced by the District of Columbia which accounts for over two-thirds of the number for the entire country. The organization for health among the several District agencies naturally embodies combined characteristics of State and municipal units and represents a rather atypical situation.

Nurses outnumber physicians nearly two to one, and somewhat fewer engineers than physicians are employed. Dentists constitute the smallest single professional group. The term "Technicians" like "Inspectors" is used in a broad sense and represents widely varying skills. X-ray technicians, physical therapists, dental hygienists, and all technical laboratory personnel from the highest grade of specialized worker—bacteriologist, serologist, chemist, pathologist, or toxicologist—down to the lowest rating for technical assistants are included here. Glass washers, nontechnical aides, and the like are classified as laborers, however.

TABLE 5.—*Full-time administrative and field personnel of different professional classifications employed by all official State agencies for health activities*

State or Territory	Number of persons of each classification employed full time for health work by all State agencies										
	All classifications	Physicians	Nurses	Engineers	Inspectors	Technicians	Dentists	Administrators not covered by other classifications	Clerical and records personnel	Laborers	Other and unclassified personnel
Total	18,737	1,064	2,091	830	2,927	1,464	154	442	5,555	1,769	2,441
Alabama	313	24	38	17	50	45	2	6	78	23	30
Arizona	77	3	8	2	6	10	------	6	27	------	15
Arkansas	98	9	10	6	6	11	3	2	42	2	7
California	637	46	50	45	163	39	4	11	186	2	91
Colorado	160	7	39	1	29	9	1	5	51	3	15
Connecticut	282	16	18	13	58	37	1	8	105	3	23
Delaware	97	9	21	2	5	11	------	26	18	4	1
District of Columbia	1,864	13	94	41	113	37	------	32	165	1,203	166
Florida	279	21	22	8	58	29	2	16	99	15	9
Georgia	204	25	20	28	47	46	------	1	94	19	14
Idaho	46	2	3	4	3	12	------	3	16	1	2
Illinois	1,012	61	101	41	200	71	6	14	331	35	152
Indiana	398	21	48	20	73	28	2	55	111	8	32
Iowa	288	18	50	18	44	20	1	11	84	4	38
Kansas	162	8	16	13	31	21	1	5	56	2	9
Kentucky	231	17	14	6	19	18	13	9	103	11	21
Louisiana	559	13	15	7	180	7	15	15	64	5	238
Maine	159	13	35	9	22	14	1	2	53	------	10
Maryland	178	9	2	10	34	19	1	------	71	13	19
Massachusetts	893	66	46	33	95	92	2	12	305	25	217
Michigan	555	23	13	73	29	59	2	25	160	------	171
Minnesota	470	27	53	20	72	39	2	10	200	12	35
Mississippi	140	10	12	5	3	18	------	2	57	3	30
Missouri	309	25	70	14	70	8	3	9	95	------	15
Montana	76	4	8	3	18	8	------	3	24	1	7
Nebraska	102	8	16	1	26	6	1	5	34	------	5
Nevada	58	3	14	1	8	7	1	2	15	------	7
New Hampshire	96	4	22	9	7	10	------	1	37	3	3
New Jersey	548	28	95	14	59	46	1	16	160	15	114
New Mexico	65	4	8	2	4	9	------	2	26	------	10
New York	1,973	107	209	100	314	142	3	6	631	101	360
North Carolina	203	12	10	14	12	38	30	1	72	8	6
North Dakota	106	6	12	7	15	15	------	4	35	3	9
Ohio	470	21	22	30	85	22	2	16	220	16	36
Oklahoma	208	17	42	7	27	18	1	7	71	------	15
Oregon	157	6	8	4	45	15	1	7	61	------	10
Pennsylvania	1,587	47	234	55	368	56	2	28	544	25	228
Rhode Island	170	9	23	6	30	24	------	8	52	7	11
South Carolina	157	19	20	15	1	17	6	2	62	1	14
South Dakota	80	5	6	5	14	13	------	1	28	4	4
Tennessee	321	52	45	11	25	47	3	1	88	13	36
Texas	376	25	52	31	31	75	6	8	96	9	43
Utah	151	12	58	3	20	9	2	7	32	2	9
Vermont	100	11	32	2	16	5	1	2	26	1	4
Virginia	433	63	108	9	81	28	22	2	112	3	5
Washington	177	7	8	6	76	13	------	5	50	2	10
West Virginia	236	8	22	15	64	15	------	5	88	5	14
Wisconsin	415	38	33	24	75	38	1	9	151	6	40
Wyoming	55	3	14	1	5	6	------	5	18	1	2
Alaska	31	3	14	1	2	2	------	------	8	1	------
Hawaii	314	9	67	6	47	42	------	2	67	53	21
Puerto Rico	508	38	79	12	35	34	7	1	170	79	53
Virgin Islands	60	9	12	------	7	4	2	1	3	17	5

Absence of a common pattern among the several States obtains for distribution of personnel according to professional classification just as it does for the agency charged with any particular activity, for expenditures made in behalf of each type of service, and for total

personnel employed. For instance, although in the aggregate approximately twice as many nurses as physicians are employed for State health work, in two States this ratio is as high as seven to one, whereas in another the order is reversed and there are four times as many physicians as nurses. Here again, local programs which complement the various State plans, but which were not incorporated in this study, probably influence the picture to a greater extent than any other single factor.

Training and public health interest are the standards generally used for evaluating the quality of personnel employed. On the whole, health departments are increasingly insistent that these standards be met by all prospective staff members. Other State agencies which carry on health activities are apt to have less clearly defined public health training requirements.

ACKNOWLEDGMENTS

The current revision of Public Health Bulletin No. 184 would not have been possible without the cordial cooperation and interest of staff members of the various agencies of State government. Their willingness to supply the mass of information requested and their assistance in adapting such material to the limits of the schedule are deeply appreciated.

Particular recognition is made of the services of the State health officers and their staffs who, in addition to providing the desired information regarding activities of their own departments, suggested other units of State government doing related work, arranged the necessary entree to these agencies, and checked the material collected for completeness of coverage. Likewise, courtesy of the health departments in making available office space and in supplying clerical assistance for the duration of the field work in the respective States greatly facilitated the assignment.

To Dr. Don W. Gudakunst, now Medical Director of the National Foundation for Infantile Paralysis, is due the credit for laying the groundwork for the survey, constructing the preliminary questionnaire, and collaborating in drafting the final form.

Actual collection of the field data represents the painstaking work of the following medical officers of the United States Public Health Service: Medical Director J. F. Worley, Senior Surgeon M. F. Haralson, Surgeon J. O. Dean, Passed Assistant Surgeons Henry A. Holle, David C. Elliott, J. R. Heller, Jr., F. W. Kratz, Charles F. Blankenship, Otis L. Anderson, and L. E. Burney, and Assistant Surgeons A. L. Chapman and David B. Wilson.

ROCKY MOUNTAIN SPOTTED FEVER[1]

A NOTE ON SOME ASPECTS OF ITS EPIDEMIOLOGY

By NORMAN H. TOPPING, *Passed Assistant Surgeon, United States Public Health Service*

In spite of several published statements to the contrary (*1*), it has long been the popular conception that Rocky Mountain spotted fever is a more highly virulent, and, therefore, a more fatal disease in the West than in the East. Up to comparatively recently, reported observations in the laboratory lent support to this belief because the strains of virus isolated and reported in the West were more pathogenic for guinea pigs than the strains isolated in the East.

For the past few years strains of the virus of Rocky Mountain spotted fever have been isolated in guinea pigs at the National Institute of Health in Washington, D. C., upon every presenting occasion along the Atlantic seaboard. These strains have all been studied during their routine passage in guinea pigs, some for as long as a year, others for not such an extended period. These isolated strains were all similar; none of them produced scrotal lesions in male guinea pigs with any degree of consistency; they all had rather prolonged incubation periods; and their fatality rates were considerably lower than our passage strain of virus which has been isolated in Montana. During the summer of 1939, however, a different strain of spotted fever virus was recovered (*2*). This strain was from a young man hospitalized with Rocky Mountain spotted fever at the Gallinger Municipal Hospital in Washington, D. C. The patient had been berry picking across the Potomac River in Virginia, where ticks were abundant. He was not critically ill, but the strain isolated from his blood was extremely virulent for guinea pigs. The fatality rates in these animals on this, the "W" strain, are as high as those for our passage virus isolated in the Bitterroot Valley of Montana, being around 80 percent for each strain. The typical scrotal lesions associated with a highly pathogenic strain of Rocky Mountain spotted fever are consistently present. The incubation period for this strain is shorter than for any of the other strains of spotted fever isolated in the East.

More recently Brigham and Watt (*3*) reported the isolation of two highly virulent strains from ticks, *D. variabilis*, in Georgia.

During the summer of 1940 the occasion arose to isolate a strain of spotted fever from a typical case of the disease in a Denver, Colo., hospital. This patient had acquired a tick while fishing near Lander, Wyo., which is located in the center of the so-called *D. andersoni* territory. The "L" strain (*4*) of spotted fever, from this patient, is extremely mild for guinea pigs, a fatality rate of 4.4 percent being observed with this strain, lower than any other strain of spotted fever

[1] From the Division of Infectious Diseases, National Institute of Health.

that we have studied. The incubation period is usually 5 days and there are no consistent scrotal reactions in guinea pigs. In all comparative tests in guinea pigs this "L" strain is indistinguishable from the usual strains of Rocky Mountain spotted fever isolated from eastern United States.

With the isolation of these two strains it became obvious that the terminology "eastern" and "western," as well as "*andersoni*" and "*variabilis*," were no longer applicable and that isolated strains had best be classified and reported according to their virulence for guinea pigs. Further, since there are highly virulent and mild strains of spotted fever virus in the East and highly virulent and mild strains in the West, as judged by pathogenicity for the guinea pig, it was thought advisable to compare data from several selected States in both areas.

The data to be presented were kindly furnished by the State health officers of 4 States, Montana and Idaho in the West, and Virginia and Maryland in the East. The data for Montana, Idaho, and Maryland cover a 10-year period, 1930–1939, inclusive. Cases and deaths were not available by sex and age in Virginia until 1933 so that the figures given for that State are for 1933–1939, inclusive.

During these periods, Idaho and Montana reported 747 cases, with a crude case fatality rate of 28.1 percent, while Maryland and Virginia reported 661 cases, with a fatality rate of 18.4 percent. In the two western States 50.2 percent of the total, or 375 cases, occurred in persons aged 40 years or over, 35.3 percent (264) in the age group 15–39 years, and only 14.4 percent (108) in persons under 15 years. In the East this age distribution was almost reversed, with the largest number of cases, 46.8 percent (310), occurring in persons under 15 years of age; 28.5 percent (189) occurred in the age group 15–39 years, and only 24.5 percent (162) in the group aged 40 or over.

When the fatality rates for the two areas are compared on the basis of age, it is seen that there is very little difference. For the age group under 15 years the fatality rate was 12.9 percent in the East and 12 percent in the West; for the group 15–39 years, 11.1 percent in the East and 15.1 percent in the West, and for the group aged 40 and over, 37.6 percent in the East and 41.8 percent in the West. No significant difference in these rates was found for the various age groups. It is apparent, however, that there are important differences in the fatality rates for the groups aged 40 and over in both areas as compared to the rates for the younger persons.

The accompanying graph and tables show the age and sex distributions in the two areas, as well as the fatality rates. It will be noted that there are proportionately more females infected in the East than in the West.

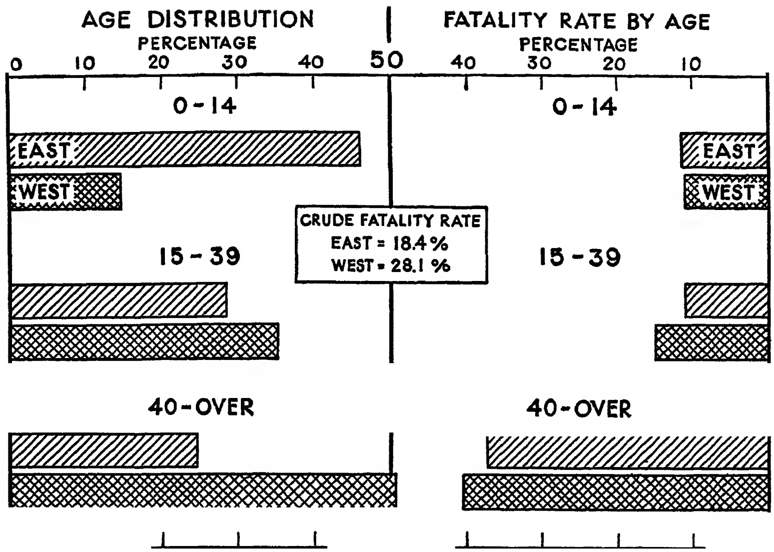


FIGURE 1.—Rocky Mountain spotted fever, eastern and western cases.

TABLE 1.—*Rocky Mountain spotted fever. Cases occurring in certain western and eastern States, by age and fatality rate*

State	Number of cases	Number of deaths	Fatality rate	Under 15 years				15–39 years				40 and over			
				Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate
West:															
Idaho	203	101	34.4	27	9.2	7	25.9	108	36.8	22	20.3	158	53.9	72	45.5
Montana	454	109	24.0	81	17.8	6	7.4	156	34.3	18	11.5	217	47.8	85	39.1
Total	747	210	28.1	108	14.4	13	12.0	264	35.3	40	15.1	375	50.2	157	41.8
East:															
Maryland	330	66	20.0	155	46.9	19	12.2	85	25.7	13	15.2	90	27.2	34	37.7
Virginia	331	56	16.9	155	46.8	21	13.5	104	31.4	8	7.6	72	21.7	27	37.5
Total	661	122	18.4	310	46.8	40	12.9	189	28.5	21	11.1	162	24.5	61	37.6

NOTE: All cases and deaths as reported to the State Health Officer; Montana, Idaho, and Maryland, 1930–39, inclusive; Virginia, 1933-39, inclusive.

TABLE 2.—*Rocky Mountain spotted fever. Cases occurring in certain western and eastern States, by sex and age*

Sex	Number of cases	Percent	Number of deaths	Rate	Under 15 years				15–39 years				40 and over			
					Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate
West:																
Male	624	83.5	182	29.1	55	7.3	5	9.0	239	31.9	32	13.3	330	44.1	145	43.9
Female	123	16.5	28	22.7	53	7.0	8	15.0	25	3.3	8	32.0	45	6.0	12	26.6
Total	747	......	210	28.1	108	14.4	13	12.0	264	35.3	40	15.1	375	50.2	157	41.8
East:																
Male	401	60.6	83	20.6	170	25.7	23	13.5	124	18.7	17	13.7	107	16.1	43	40.1
Female	260	39.4	39	15.0	140	21.2	17	12.1	65	9.8	4	6.1	55	8.3	18	32.7
Total	661	......	122	18.4	310	46.8	40	12.9	189	28.5	21	11.1	162	24.5	61	37.6

DISCUSSION AND SUMMARY

Although it is realized that there are inherent inaccuracies in the data presented, it is believed that they are sufficiently reliable to show rather clearly certain interesting facts concerning the epidemiology of Rocky Mountain spotted fever. The first is the high percentage of infections among children in the East and among males 40 years of age and over in the West. There are several possible explanations of this difference in incidence. It may be due merely to the amount of tick exposure among persons of the different age and sex groups. In the East only a small percentage of the total adult male population is engaged in occupations which would bring them into contact with the vector. In that area, many persons would be exposed to ticks only during recreational activities, while in the West a large percentage of the total adult male population is engaged in occupations which would expose them to tick contacts. In both areas children would be exposed to ticks while playing, but, since the East is more densely populated, more children in that area would be exposed to risk of infection.

Another possible explanation might be concerned with the biology of the two ticks in question, *D. andersoni* in the West and *D. variabilis* in the East. The hosts for the adults of both species are the larger mammals. The West, with large numbers of large wild mammals such as deer, elk, mountain goats, and the like, may be more heavily infested with ticks in areas removed from habitation. The hosts of *D. variabilis* are mainly domesticated animals, such as the dog, horse, cow, etc., and, therefore, tick infestation may be greater about the areas of habitation. If this were true, adult males in the West in the course of rural occupations in these remote areas would risk tick exposure more frequently than persons of any other age group. But in the East, children at play about their homes would represent the group with the greatest exposure. The actual explanation of age and sex distribution of cases of Rocky Mountain spotted fever in the two areas is not known and may represent a combination of several such factors.

The question of virulence of spotted fever has been discussed by various writers. Large local variations in case fatality rates have been reported, ranging from 70 to 80 percent for western Montana to about 5 percent for certain areas in Idaho. The data here reported represent relatively large numbers and local differences in case fatality rates do not appear. However, since the figures were collected in a comparable manner in the two areas, the differences or the lack of differences should be significant. If the reported cases with either high or low fatality rates represented an appreciable percentage of the total cases, then this should be reflected in the final figures. If it is

assumed that the figures for the West represent only an average for several local areas of high virulence plus several areas of low virulence, then the same assumption holds for the two eastern States. In any event, the data presented warrant the statement that for the period studied Rocky Mountain spotted fever is as fatal a disease in Maryland and Virginia as it is in Montana and Idaho for cases of the disease in comparable age groups.

REFERENCES

(1) a. Parker, R. R.: Rocky Mountain spotted fever. J. Am. Med. Assoc., **110**: 1185–1188; 1273–1278 (April 9, 16, 1938).
b. Parker, R. R.: Certain phases of the problem of Rocky Mountain spotted fever. Arch. Path., **15**: 398–429 (March 1933).
(2) Topping, Norman H., and Dyer, R. E.: A highly virulent strain of Rocky Mountain spotted fever virus isolated in the eastern United States. Pub. Health Rep., **55**: 728–731 (April 26, 1940).
(3) Brigham, G. D., and Watt, James: Highly virulent strains of Rocky Mountain spotted fever virus isolated from ticks (*D. variabilis*) in Georgia. Pub. Health Rep., **55**: 2125 (Nov. 16, 1940).
(4) Topping, Norman H.: A strain of Rocky Mountain spotted fever virus of low virulence isolated in the western United States. In press.

PUBLIC HEALTH SERVICE PUBLICATIONS

A List of Publications Issued During the Period January–June 1941

The following is a list of publications of the United States Public Health Service issued during the period January–June 1941.

The purpose of the publication of this list is to provide a complete and continuing record of Public Health Service publications, for reference use by librarians, scientific workers, and others interested in particular fields of public health work, and not to offer the publications for indiscriminate free public distribution.

Those publications marked with an asterisk (*) may be obtained only by purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices noted.

Periodicals

*Public Health Reports (weekly), January–June, vol. 56, nos. 1 to 26, pages 1 to 1349. 5 cents a number.

*Venereal Disease Information (monthly), January–June, vol. 22, nos. 1 to 6, pages 1 to 231. 5 cents a number.

*Journal of the National Cancer Institute (bimonthly), August–April, vol. 1, nos. 1 to 5, pages 1 to 725. 40 cents a number.

Reprints from the Public Health Reports

2221. Mental hygiene in the State health department. By Victor H. Vogel. January 3, 1941. 10 pages.

2222. Directory of State and insular health authorities, 1940. January 3, 1941. 14 pages.

2223. Summary of physical findings on men drafted in the World War. By Rollo H. Britten and George St. J. Perrott. January 10, 1941. 22 pages.
2224. Report of a new type of pneumococcus which crosses with types X, XI, XX, XXIX, and XXXI antipneumococcic serums. By Alice L. Chinn and Bernice E. Eddy. January 10, 1941. 14 pages.
2225. A study of certain factors which influence the determination of the mouse protective action of meningococcus antiserum. By Margaret Pittman. January 17, 1941. 18 pages.
2226. An institutional outbreak of pneumonitis. III. Histopathology in man and rhesus monkeys in the pneumonitis due to the virus of "Q" fever. By R. D. Lillie, T. L. Perrin, and Charles Armstrong. January 24, 1941. 7 pages; 2 plates.
2227. Principal provisions of smallpox vaccination laws and regulations in the United States. By William Fowler. January 31, 1941. 23 pages.
2228. Procedure for the maintenance of housing standards in Milwaukee. By Charles L. Senn. January 31, 1941. 9 pages.
2229. Qualifications of professional public health personnel. III. Nurses. By Mayhew Derryberry and George Caswell. February 7, 1941. 19 pages.
2230. Note on the "most probable number" index as used in bacteriology. By J. M. DallaValle. February 7, 1941. 5 pages.
2231. Biological products. Establishments licensed for the propagation and sale of viruses, serums, toxins, and analogous products. February 7, 1941. 7 pages.
2232. Report on market milk supplies of certain urban communities, January 1, 1939–December 31, 1940. February 7, 1941. 5 pages.
2234. The response of peritoneal tissue to industrial dusts. By John W. Miller and R. R. Sayers. February 14, 1941. 9 pages.
2235. Immunological relationships between the rickettsiae of Australian and American "Q" fever. By Ida A. Bengtson. February 14, 1941. 10 pages.
2236. The inhibiting effect of urea on the microbiological assay of riboflavin. By Harris Isbell, J. G. Wooley, and H. F. Fraser. February 14, 1941. 4 pages.
2237 Qualifications of professional public health personnel. IV. Sanitation personnel. By Mayhew Derryberry and George Caswell. February 21, 1941. 17 pages.
2238. Studies on active and passive immunity in "Q" fever infected and immunized guinea pigs. By Ida A. Bengtson. February 21, 1941. 18 pages.
2239. Domestic water and dental caries. I. A dental caries study, including *L. acidophilus* estimations, of a population severely affected by mottled enamel and which for the past 12 years has used a fluoride-free water. By H. Trendley Dean, Philip Jay, Francis A. Arnold, Jr., and Elias Elvove. February 28, 1941. 17 pages.
2240. A further study of the Rorschach test applied to delinquents. By M. J. Pescor. February 28, 1941. 16 pages.
2241. *Ornithodoros viguerasi*, a new species of tick from bats in Cuba (Acarina: Ixodoidea). By R. A. Cooley and Glen M. Kohls. February 28, 1941. 4 pages; 1 plate.
2242. Carbon monoxide: its toxicity and potential dangers. March 7, 1941. 13 pages.
2243. Financial support of hospitals controlled by State and local governments. By Elliott H. Pennell, Joseph W. Mountin, and Kay Pearson. March 7, 1941. 13 pages.

2244. Qualifications of professional public health personnel. V. Laboratory workers. By Mayhew Derryberry and George Caswell. March 7, 1941. 10 pages.
2245. Alcoholism and public health. By Lawrence Kolb. March 14, 1941. 14 pages.
2246. Hospitals existing singly in counties have similar financial structure. By Joseph W. Mountin, Elliott H. Pennell, and Kay Pearson. March 14, 1941. 12 pages.
2247. Human riboflavin requirement estimated by urinary excretion of subjects on controlled intake. By W. H. Sebrell, Jr., R. E. Butler, J. G. Wooley, and Harris Isbell. March 14, 1941. 10 pages.
2248. Benzene (benzol): its toxicity and potential dangers. March 14, 1941. 8 pages.
2249. War and infectious disease. By Clara E. Councell. March 21, 1941. 27 pages.
2250. Carbon disulfide: its toxicity and potential dangers. March 21, 1941.

2251. Experimental poliomyelitis. The use of a variety of laboratory techniques in efforts to establish seven strains of poliomyelitis virus in the cotton rat. By S. D. Kramer and W. N. Mack, with the assistance of A. T. Himes. March 21, 1941. 6 pages.
2252. Three new species of *Ornithodoros* (Acarina: Ixodoidea). By R. A Cooley and Glen M. Kohls. March 21, 1941. 8 pages; 2 plates.
2253. Illness and accidents among persons living under different housing conditions. Data based on the National Health Survey. By Rollo H. Britten and Isidore Altman. March 28, 1941. 32 pages.
2254. Factors influencing the efficacy of phenolized rabies vaccines. II. Virus content of vaccine. By Karl Habel. March 28, 1941. 9 pages.
2255. Complement fixation in endemic typhus fever. By Ida A. Bengtson. March 28, 1941. 5 pages.
2256. Hydrogen sulfide: its toxicity and potential dangers. April 4, 1941. 9 pages.
2257. Tissue factors in antirabies immunity of experimental animals. By Karl Habel. April 4, 1941. 11 pages.
2258. The incidence of cancer in Detroit and Wayne County, Michigan, 1937. By Arthur J. McDowell. April 4, 1941. 37 pages.
2259. Mobile laboratory units of the Ohio River Pollution Survey. By F. E. DeMartini. April 11, 1941. 7 pages; 2 plates.
2260. Domestic water and dental caries. II. A study of 2,832 white children, aged 12–14 years, of 8 suburban Chicago communities, including *Lactobacillus acidophilus* studies of 1,761 children. By H. Trendley Dean, Philip Jay, Francis A. Arnold, Jr., and Elias Elvove. April 11, 1941. 32 pages.
2261. The application of the human serum opacity reaction for evaluating the antitoxin binding power (Lb) of *Clostridium perfringens* (type A) toxoid. By S. C. Seal and Sarah E. Stewart. April 11, 1941. 8 pages.
2262. Disabling morbidity among industrial workers, final quarter of 1940, with an index of the previous publications of this series. By William M. Gafafer. April 11, 1941. 4 pages.
2263. Mechanical aids for stream surveys. By C. T. Carnahan. April 18, 1941. 7 pages; 4 plates.

2264. Studies on immunizing substances in pneumococci. XI. Effect of variation in dosage of antigenic polysaccharide on serum antibody titer in human beings. By Lloyd D. Felton, W. Ross Cameron, and Perry Franklin Prather. April 18, 1941. 16 pages.

2265. Studies on trichinosis. XIII. The incidence of human infection with trichinae as indicated by post-mortem examination of 3,000 diaphragms from Washington, D. C., and five eastern seaboard cities. By K. B. Kerr, Leon Jacobs, and Eugenia Cuvillier. April 18, 1941. 21 pages.

2266. Recent developments relating to public health interest in housing. By John C. Leukhardt. April 25, 1941. 4 pages.

2267. Prevalence of poliomyelitis in the United States in 1940. By C. C. Dauer. April 25, 1941. 9 pages.

2268. A preliminary survey of the anopheline mosquito fauna of southeastern Minnesota and adjacent Wisconsin areas. By Richard H. Daggy, Oswald J. Muegge, and William A. Riley. April 25, 1941. 13 pages; 1 plate.

2269. Post-sanatorium tuberculosis survival rates in Minnesota. By H. E. Hilleboe. April 25, 1941. 13 pages.

2270. Choriomeningitis virus infection without central nervous system manifestations. Report of a case. By Charles Armstrong and J. W. Hornibrook. April 25, 1941. 4 pages.

2271. Further new species of *Ornithodoros* from bats (Acarina: Argasidae). By R. A. Cooley and Glen M. Kohls. April 25, 1941. 5 pages; 1 plate.

2272. The Dick reaction and scarlet fever morbidity following injections of a purified and tannic acid precipitated erythrogenic toxin. By M. V. Veldee, E. C. Peck, J. P. Franklin, and H. R. DuPuy. May 2, 1941. 18 pages.

2273. Bactericidal effect of the paraffining of paperboard used for paper milk containers. By Frederic J. Moss, Robert C. Thomas, and Mildred K. Havens. May 2, 1941. 13 pages; 1 plate.

2274. Special problems in our health defenses. By Paul V. McNutt. May 9, 1941. 5 pages.

2275. A clinical study of poliomyelitis in Charleston County, South Carolina, 1939. By Dorland J. Davis, Francis J. Weber, and Margaret S. Arey. May 9, 1941. 11 pages.

2276. Causes of physical disqualification under the Selective Service Law. Early indications. By Rollo H. Britten and George St. J. Perrott. May 9, 1941. 5 pages.

2277. A portable unit for the determination of halogenated hydrocarbons. By H. C. Dudley. May 9, 1941. 7 pages.

2278. Tannic acid treatment of poison ivy (Rhus spp.) dermatitis. By Louis Schwartz and Leon H. Warren. May 16, 1941. 3 pages; 1 plate.

2279. Studies on immunizing substances in pneumococci. XII. Comparison of the effect of whole-cell vaccine and of polysaccharide antigen in human beings. By Lloyd D. Felton, Carl F. Jordan, E. N. Hesbacher, and Ellis K. Vaubel. May 16, 1941. 14 pages.

2280. An outbreak of psittacosis at the National Zoological Park, Washington, D. C. By T. H. Tomlinson, Jr. May 23, 1941. 9 pages.

2281. Quantitative studies of the tuberculin reaction. I. Titration of tuberculin sensitivity and its relation to tuberculous infection. By Michael L. Furcolow, Barbara Hewell, Waldo E. Nelson, and Carroll E. Palmer. May 23, 1941. 19 pages.

2282. The responsibility of the nursing profession in industrial hygiene. By J. J. Bloomfield. May 30, 1941. 11 pages.

2283. The incidence of cancer in New Orleans, La., 1937. By Arthur J. McDowell. May 30, 1941. 30 pages.
2284. State and territorial health officers confer on health defenses. June 6, 1941. 24 pages.
2285. The National Nutrition Conference. June 13, 1941. 23 pages.
2286. Cirrhosis of the liver in rats on a deficient diet and the effect of alcohol. By R. D. Lillie, F. S. Daft, and W. H. Sebrell, Jr. June 13, 1941. 4 pages; 1 plate.
2287. Radio pratique at the port of New York. June 20, 1941. 9 pages.
2288. The growth and effects of the tubercle bacillus on the chorio-allantoic membrane of the chick embryo: a method for studies in chemotherapy. By E. W. Emmart and M. I. Smith. June 20, 1941. 10 pages; 4 plates.
2289. Medical evaluation of nutritional status. IV. The ocular manifestations of avitaminosis A, with especial consideration of the detection of early changes by biomicroscopy. By H. D. Kruse. June 27, 1941. 24 pages.

Supplement to the Public Health Reports

163. The notifiable diseases. Prevalence during 1939 in States. 1941. 14 pages.

Reprints from Venereal Disease Information

134. Survey of venereal diseases in the District of Columbia. By Lida J. Usilton and George C. Ruhland. Vol. 21, August 1940. 11 pages.
135. Medical and social research in the treatment and control of gonorrhea. By Rogers Deakin, Morris S. Wortman, and John V. Lawrence. Vol. 21, August 1940. 10 pages.
136. Malaria and artificial fever in the treatment of paresis. By Paul A. O'Leary, Walter L. Breutsch, Franklin G. Ebaugh, Walter M. Simpson, Harry C. Solomon, Stafford L. Warren, R. A. Vonderlehr, Lida J. Usilton, and I. V. Sollins. Vol. 21, September 1940. 10 pages.
138. Prophylaxis. Report of special joint committee. By H. H. Hazen, Ira V. Hiscock, P. S. Pelouze, William F. Snow, Hans Zinsser, and Ray H. Everett. Vol. 21, October 1940. 3 pages.
139. Why don't we stamp out gonorrhea? By N. A. Nelson. Vol. 21, October 1940. 7 pages.
140. A limited survey of public opinion on syphilis. By Morris S. Wortman. Vol. 21, October 1940. 7 pages.
141. Studies in the epidemiology of syphilis. I. Material on which epidemiologic studies are based. II. Contact investigation. By E. Gurney Clark. Vol. 21, November 1940. 21 pages.
142. Social hygiene. By N. A. Nelson. Vol. 21, December 1940. 9 pages.
143. Purification of antigen for microscopic slide precipitation tests for syphilis. By B. S. Kline. Vol. 21, December 1940. 3 pages.
144. Severe reactions to arsphenamine. By J. R. Waugh and Elizabeth Milovich. Vol. 21, December 1940. 6 pages.
145. Studies in the epidemiology of syphilis. III. Conjugal syphilis. By Louis J. Klingbeil and E. Gurney Clark. Vol. 22, January 1941. 6 pages.
146. Studies in the epidemiology of syphilis. IV. The value of patient education. By H. H. Cowper and E. Gurney Clark. Vol. 22, January 1941. 5 pages.
147. Purification of the antigen of syphilis. By John W. Wellman and Herman P. Laukelma. Vol. 22, January 1941. 3 pages.
148. Prince Albert Morrow, M. D. By Edward L. Keyes. Vol. 22, February 1941. 5 pages.

149. Syphilis and gonorrhea control. By C. C. Pierce. Vol. 22, February 1941. 10 pages.
150. Progress in the control of venereal diseases in Virginia. By Otis L. Anderson. Vol. 22, March 1941. 12 pages.
151. Extragenital chancroid. By Robert Brandt, Everett S. Sanderson, and David V. Hicks. Vol. 22, March 1941. 2 pages.
152. The biochemistry of the gonococcus and its practical importance. By Wolfgang A. Casper. Vol. 22, April 1941. 5 pages.
153. The effect of sodium thiosulfate on excretion of arsenic. By E. T. Ceder, Leo Zon, and Mary E. Klinger. Vol. 22, April 1941. 6 pages.

Supplements to Venereal Disease Information

13. The newer chemotherapy of venereal diseases. A symposium. 42 pages.
14. Modern serologic tests for syphilis and their interpretation by the physician. 81 pages.

Venereal Disease Folders

4. The doctor says. 8 pages.
7. Venereal disease and national defense. 8 pages.

Venereal Disease Posters

12. Syphilitic mothers—untreated and treated.
13. Know for sure. Get a blood test.

Reprints From the Journal of the National Cancer Institute

1. The Federal cancer control program. By Carl Voegtlin and R. R. Spencer. August 1940. 9 pages.
2. The approaches to cancer research. By Carl Voegtlin. August 1940. 5 pages.
3. Intestinal carcinoma and other lesions in mice following oral administration of 1, 2, 5, 6-dibenzanthracene and 20-methylcholanthrene. By Egon Lorenz and Harold L. Stewart. August 1940. 24 pages; 5 plates.
4. Relative importance of local and constitutional effects of methylcholanthrene in production of skin tumors in the mouse. By G. Burroughs Mider and John J. Morton. August 1940. 4 pages.
5. Studies in carcinogenesis. XII. Effect of the basic fraction of creosote oil on the production of tumors in mice by chemical carcinogens. By Robert D. Sall and M. J. Shear, with the assistance of Joseph Leiter and Adrien Perrault. August 1940. 11 pages.
6. Comparative carcinogenicity of three carcinogenic hydrocarbons. By Michael B. Shimkin and Howard B. Andervont. August 1940. 6 pages.
7. The effect of variation in oxygen tension and sulfhydryl concentration on nuclear growth and fission in *Amoeba proteus*. By H. W. Chalkley and Carl Voegtlin. August 1940. 13 pages.
8. Chemical studies on the components of normal and neoplastic tissues. I. Viscosity and streaming birefringence of sodium thymonucleate. By Jesse P. Greenstein, with the technical assistance of Wendell V. Jenrette. August 1940. 14 pages.
9. Chemical studies on the components of normal and neoplastic tissues. II. The nucleoprotein fraction of normal animal liver. By Jesse P. Greenstein, with the technical assistance of Wendell V. Jenrette. August 1940. 14 pages.

10. Lung tumors and heredity. I. The susceptibility of four inbred strains of mice and their hybrids to pulmonary tumors induced by subcutaneous injection. By W. E. Heston. August 1940. 7 pages.
11. Glutamic acid from normal and cancerous tissue. By J. M. Johnson. August 1940. 5 pages.
12. Carcinogenic potency of stilbestrol and estrone in strain C_3H mice. By Michael B. Shimkin and Hugh G. Grady. August 1940. 10 pages; 6 plates.
13. Effect of carcinogens on small free-living organisms. I. *Eberthella typhi.* By R. R. Spencer and M. B. Melroy. October 1940. 8 pages.
14. Further studies on the susceptibility of hybrid mice to induced and spontaneous tumors. By H. B. Andervont. October 1940. 13 pages.
15. The influence of foster nursing upon the incidence of spontaneous mammary cancer in resistant and susceptible mice. By H. B. Andervont. October 1940. 9 pages.
16. Breast cancer in mice as influenced by nursing. By John J. Bittner. October 1940. 16 pages.
17. The significance of hormones in the origin of cancer. By Leo Loeb. October 1940. 29 pages.
18. The complement-fixing capacity of the rabbit-papilloma-virus protein. By W. Ray Bryan, Dorothy W. Beard, and J. W. Beard. October 1940. 9 pages.
19. The rate of turnover of the lecithins and cephalins of carcinosarcoma 256 as measured by radioactive phosphorus. By Frances L. Haven. October 1940. 7 pages.
20. Biologic testing of carcinogens. I. Subcutaneous injection technique. By Michael B. Shimkin. October 1940. 15 pages.
21. Biologic testing of carcinogens. II. Pulmonary-tumor-induction technique. By Howard B. Andervont and Michael B. Shimkin. October 1940. 17 pages; 3 plates.
22. Induced pulmonary tumors in mice. III. The role of chronic irritation in the production of pulmonary tumors in strain A mice. By Michael B. Shimkin and Joseph Leiter. October 1940. 16 pages; 6 plates.
23. The action of 2-amino-5-azotoluene in the production of liver tumors of rats and the behavior of these tumors in vitro. By Emily W. Emmart. October 1940. 20 pages; 5 plates.
24. Squamous cell carcinoma and other lesions of the forestomach in mice, following oral administration of 20-methylcholanthrene and 1, 2, 5, 6-dibenzanthracene. By Egon Lorenz and Harold L. Stewart. October 1940. 6 pages; 3 plates.
25. Radiation and the cell. By Paul S. Henshaw. December 1940. 14 pages.
26. Studies in carcinogenesis. XIII. Splenic and hepatic tumors in mice following the introduction of hydrocarbons into the spleen and liver. By M. J. Shear, Harold L. Stewart, and Arnold Seligman. December 1940. 12 pages; 7 plates.
27. Studies in carcinogenesis. XIV. 3-substituted and 10-substituted derivatives of 1, 2-benzanthracene. By M. J. Shear and Joseph Leiter, with the assistance of Adrien Perrault. December 1940. 34 pages.
28. Retardation of growth of the rat ingesting p-dimethylaminoazobenzene (butter yellow). I. The effect of various dietary supplements. By Julius White. December 1940. 5 pages.
29. Effect of carcinogens on small free-living organisms. II. Survival value of methylcholanthrene adapted paramecium. By R. R. Spencer and M. B. Melroy. December 1940. 6 pages.

30. Tumors in mice injected with colloidal thorium dioxide. By H. B. Andervont and M. B. Shimkin. December 1940. 5 pages; 3 plates.
31. Preparation of dispersions of carcinogenic hydrocarbons and hormones with the aid of dioctyl ester of sodium sulfosuccinate (Aerosol O. T.). By Egon Lorenz, Michael B. Shimkin, and Harold L. Stewart. December 1940.
32. Effect of colchicine and bacterial products upon transplantable and spontaneous tumors in mice. By H. B. Andervont. December 1940. 6 pages.
33. Chemical studies on the components of normal and neoplastic tissues. III. The composition and amphoteric properties of the nucleoprotein fraction of the Jensen rat sarcoma. By Jesse P. Greenstein, J. W. Thompson, and Wendell V. Jenrette. December 1940. 10 pages.
34. Chemical studies on the components of normal and neoplastic tissues. IV. The melanin-containing pseudoglobulin of the malignant melanoma of mice. By Jesse P. Greenstein, Floyd C. Turner, and Wendell V. Jenrette. December 1940. 9 pages.
35. The influence of genetic constitution upon the induction of resistance to transplantable mouse tumors. By Morris K. Barrett. December 1940. 7 pages.
36. Convenient inexpensive device for quantitative hand feeding of mice. By Harold P. Morris and J. W. Thompson. December 1940. 2 pages; 2 plates.
37. Sunlight and cancer of the skin. By Harold F. Blum. December 1940. 25 pages.
38. Trend and geographic variation in cancer mortality and prevalence, with special reference to gastric cancer. By Selwyn D. Collins, Mary Gover, and Harold F. Dorn. February 1941. 25 pages.
40. Experimental observations on achlorhydria of gastric cancer. By Alexander Brunschwig, Robert L. Schmitz, and Richard Rasmussen. February 1941. 8 pages.
41. Hyperplastic and neoplastic lesions of the stomach in mice. By Harold L. Stewart. February 1941. 21 pages; 12 plates.
42. Gastric cancer as a sequel to gastritis, particularly the gastritis of pernicious anemia. By C. P. Rhoads. February 1941. 12 pages.
43. The use of clinical material for the investigation of gastric cancer. By Mont R. Reid. February 1941. 15 pages.
44. A program for the study of cancer of the stomach. By Carl Voegtlin. February 1941. 20 pages.
45. Experimental gastric carcinoma: A critical review with comments on the criteria of induced malignancy. By Alfred J. Klein and Walter Lincoln Palmer. February 1941. 26 pages.

Public Health Bulletins

260. The prevalence of disabling illness among male and female workers and housewives. By David E. Hailman. 1941. 40 pages.
261. Urban housing and crowding. Relation to certain population characteristics as indicated by National Health Survey data. By Rollo H. Britten and J. E. Brown. 1941. 123 pages.
262. The control of the lead hazard in the storage battery industry. By Waldemar C. Dreessen, Thomas I. Edwards, Warren H. Reinhart, Richard T. Page, Stewart H. Webster, David W. Armstrong, and R. R. Sayers. 1941. 138 pages; 24 halftones.

263. Mercurialism and its control in the felt-hat industry. By Paul A. Neal, Robert H. Flinn, Thomas I. Edwards, Warren H. Reinhart, J. Walter Hough, J. M. DallaValle, Frederick H. Goldman, David W. Armstrong, Albert S. Gray, Allan L. Coleman, and B. F. Postman. 1941. 132 pages; 14 halftones.
264. Medical and nursing services for the maternal cases of the National Health Survey. By Jennie C. Goddard. 1941. 63 pages.
265. Fatigue and hours of service of interstate truck drivers. By Benjamin F. Jones, Robert H. Flinn, E. Cuyler Hammond, Wallace H. Wulfeck, Richard H. Lee, D. D. Donahue, Heinz Specht, H. D. Baernstein, Ralph C. Channell, and J. Walter Hough. General supervision of R. R. Jones and R. R. Sayers. 1941. 286 pages; 12 halftones.
266. Occupational and related dermatoses. Abstracts from the literature for the years 1935 to 1939, inclusive. By Louis Schwartz and Leon H. Warren. 1941. 160 pages.
267. A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. By Paul A. Neal, Waldemar C. Dreessen, Thomas I. Edwards, Warren H. Reinhart, Stewart H. Webster, Harold T. Castberg, and Lawrence T. Fairhall. 1941. 181 pages; 13 halftones.

National Institute of Health Bulletins

175. Siphonaptera. A study of the species infesting wild hares and rabbits of North America north of Mexico. By Glen M. Kohls. 1940. 34 pages; 3 plates.
177. Pathology of Rocky Mountain spotted fever. I. The pathology of Rocky Mountain spotted fever. II. The pathologic histology of Rocky Mountain spotted fever in the rhesus monkey *Macaca mulatta*. By R. D. Lillie. 1941. 59 pages; 36 halftones.

Workers Health Series

1. . . . but flu is tougher.
2. Leonard's appendix—and how it burst.

Posters

1. Cancer. Early diagnosis would save 50,000 lives every year.
2. Cancer. From 7th to 2nd place among the big killers—in the last 25 years.
3. Cancer. Only X-ray, radium, surgery, ever cured cancer.
4. Cancer danger signals.

Unnumbered Publications

Index to Public Health Reports, volume 55, part 2, July–December 1940. 18 pages.

National Negro Health Week bulletin. This pamphlet is published annually, usually about the middle of March, for community leaders in an effort to suggest ways and means by which interested individuals and organizations may be organized for a concerted and effective attack upon the community's disease problems. Twenty-seventh observance, March 30–April 6, 1941. 8 pages.

National Negro Health Week poster. Twenty-seventh observance, March 30–April 6, 1941.

National Negro Health Week leaflet. Twenty-seventh observance, March 30–April 6, 1941. 2 pages.

Annual Report

Annual Report of the Surgeon General of the United States Public Health Service for the fiscal year 1940. 191 pages; 2 halftones.

DEATHS DURING WEEK ENDED AUGUST 9, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 9, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,584	7,210
Average for 3 prior years	7,266	
Total deaths, first 32 weeks of year	277,697	278,732
Deaths per 1,000 population, first 32 weeks of year, annual rate	12.1	12.2
Deaths under 1 year of age	550	481
Average for 3 prior years	484	
Deaths under 1 year of age, first 32 weeks of year	16,902	16,171
Data from industrial insurance companies:		
Policies in force	64,409,728	64,946,651
Number of death claims	11,901	12,147
Death claims per 1,000 policies in force, annual rate	9.6	9.8
Death claims per 1,000 policies, first 32 weeks of year, annual rate	9.9	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 16, 1941

Summary

For the current week, 549 cases of poliomyelitis were reported in the United States, as compared with 422 for the preceding week and with the 1936–40 median of 343. The current rate of increase was the same as for last week—about 30 percent. The current figure is higher than that for the corresponding week of any other year since 1935, when 721 cases were reported.

More than one-half of the cases were reported from the South Atlantic and East South Central States, and these States, together with the Middle Atlantic group, reported approximately 72 percent of the total. The incidence continues low in the West Central, Mountain, and Pacific areas. The following 12 States reported 15 or more cases during the current week (last week's figures in parentheses): Alabama, 82 (80); Georgia, 69 (71); New York, 49 (30); Pennsylvania, 45 (17); Ohio, 37 (27); Tennessee, 37 (31); Illinois, 18 (8); New Jersey, 17 (13); Michigan, 16 (10); Maryland, 16 (11); North Carolina, 16 (10); and Kentucky, 15 (13).

North Dakota reported 340 cases of encephalitis, Minnesota 121, South Dakota 44, and Colorado 32. Approximately 700 cases, with about 55 deaths, have been reported in North Dakota since July 1. Twenty-two cases were reported in the Province of Manitoba, Canada, for the week ended August 15.[1]

One human case of plague was reported in California.

Of 166 cases of endemic typhus fever, 123 cases were reported in Texas and 24 cases in Georgia. Of 19 cases of Rocky Mountain spotted fever only 2 occurred in the Rocky Mountain States. Four cases of tularemia were reported in Utah.

The death rate for the current week in 88 large cities was 10.2 per 1,000 population, as compared with 10.6 for the preceding week and with a 3-year (1938–40) average of 10.1.

[1] See p 1721

Telegraphic morbidity reports from State health officers for the week ended August 16, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria, Week ended— Aug. 16, 1941	Diphtheria, Week ended— Aug. 17, 1940	Diphtheria, Median 1936–40	Influenza, Week ended— Aug. 16, 1941	Influenza, Week ended— Aug. 17, 1940	Influenza, Median 1936–40	Measles, Week ended— Aug. 16, 1941	Measles, Week ended— Aug. 17, 1940	Measles, Median 1936–40	Meningitis, meningococcus, Week ended— Aug. 16, 1941	Meningitis, meningococcus, Week ended— Aug. 17, 1940	Meningitis, meningococcus, Median 1936–40
NEW ENG.												
Maine	0	1	0	------	1	1	31	15	7	1	0	0
New Hampshire	0	0	0	------	------	------	0	1	1	0	0	0
Vermont	0	0	0	------	------	------	24	12	9	0	0	0
Massachusetts	0	6	4	------	------	------	66	97	52	1	0	1
Rhode Island	0	0	0	------	------	------	6	11	0	0	0	0
Connecticut	1	0	0	------	1	1	22	11	10	0	0	0
MID. ATL.												
New York	11	7	17	[1] 3	[1] 6	[1] 1	134	152	127	5	4	7
New Jersey	2	7	5	2	2	3	45	64	36	0	0	0
Pennsylvania [2]	3	5	14	------	------	------	91	61	53	0	2	4
E. NO. CEN.												
Ohio [2]	2	2	8	2	5	5	35	15	15	1	0	0
Indiana [2]	3	5	5	3	1	1	7	3	5	0	0	0
Illinois	7	13	13	------	1	2	27	27	20	0	2	1
Michigan [3]	4	0	7	2	------	------	39	101	36	0	0	1
Wisconsin	0	0	1	11	8	11	101	125	37	0	0	0
W. NO. CEN.												
Minnesota	1	0	2	------	1	1	2	6	6	0	0	0
Iowa	2	0	3	2	------	------	18	15	5	0	2	1
Missouri	10	2	8	------	------	22	17	0	1	0	0	0
North Dakota	0	2	0	6	5	1	16	1	1	0	0	0
South Dakota	1	1	1	------	------	------	1	2	0	0	0	0
Nebraska	0	1	1	------	------	------	0	0	2	0	1	1
Kansas	4	3	3	1	------	------	22	14	5	1	0	1
SO. ATL.												
Delaware	0	0	0	------	------	------	0	0	0	0	0	0
Maryland [2] [3]	1	1	5	1	------	------	40	4	4	3	0	1
Dist. of Col. [2]	1	0	1	2	------	------	6	1	4	0	1	1
Virginia [2]	1	6	13	42	47	------	60	33	33	2	1	1
West Virginia [3]	4	11	8	9	7	9	22	4	4	0	0	1
North Carolina	13	6	23	------	------	------	27	2	5	2	0	1
South Carolina [4]	5	4	5	95	145	52	36	3	3	0	0	0
Georgia [4]	12	6	20	7	7	------	29	4	------	0	0	0
Florida [4]	0	1	3	2	1	------	3	1	2	1	0	0
E. SO. CEN.												
Kentucky	2	10	8	1	8	3	21	26	8	0	2	2
Tennessee	6	5	11	27	26	11	18	5	5	2	1	1
Alabama [4]	9	9	13	11	2	5	7	13	5	0	0	0
Mississippi [3] [4]	8	4	9	------	------	------	------	------	------	0	1	1
W. SO. CEN.												
Arkansas	4	5	8	------	4	4	36	13	6	0	0	0
Louisiana [4]	7	6	10	------	1	5	1	4	4	2	0	2
Oklahoma	0	3	4	15	3	3	6	1	1	0	0	1
Texas [4]	25	27	28	320	122	45	60	47	14	1	2	2
MOUNTAIN												
Montana [2]	2	1	1	------	3	2	5	10	10	0	0	1
Idaho	0	0	0	------	------	------	3	2	2	0	0	0
Wyoming [2]	1	1	0	------	------	------	5	1	1	0	0	0
Colorado	5	4	2	9	4	------	8	5	5	1	0	0
New Mexico	0	0	1	1	1	------	21	9	8	0	0	0
Arizona	1	0	1	9	9	9	12	3	3	0	0	1
Utah [3]	0	0	0	3	------	------	7	19	9	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	2	1	------	------	------	4	20	11	1	0	0
Oregon	0	3	1	5	3	6	8	11	7	0	1	0
California	7	7	19	25	9	10	101	54	55	1	0	3
Total	166	177	316	616	433	324	1,250	1,028	879	25	20	49
33 weeks	7,626	8,865	13,743	599,872	169,222	151,650	830,447	228,492	270,050	1,416	1,158	2,163

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 16, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Aug. 16, 1941	Aug. 17, 1940		Aug. 16, 1941	Aug. 17, 1940		Aug. 16, 1941	Aug. 17, 1940		Aug. 16, 1941	Aug. 17, 1940	
NEW ENG.												
Maine	0	3	3	0	4	2	0	0	0	0	0	0
New Hampshire	0	0	0	2	2	1	0	0	0	1	0	0
Vermont	2	0	0	0	5	3	0	0	0	0	0	0
Massachusetts	11	3	3	40	18	25	0	0	0	10	2	2
Rhode Island	2	2	0	1	0	0	0	0	0	1	2	1
Connecticut	7	3	3	1	3	6	0	0	0	0	0	2
MID. ATL.												
New York	49	9	9	38	55	55	0	0	0	15	11	25
New Jersey	17	1	4	25	21	20	0	0	0	1	8	8
Pennsylvania [2]	45	3	5	42	40	53	0	0	0	14	18	18
E. NO. CEN.												
Ohio [1]	37	36	11	34	38	40	0	0	1	14	10	16
Indiana [2]	5	58	2	6	14	14	1	0	2	7	6	8
Illinois	18	7	9	31	52	64	2	1	2	6	11	19
Michigan [3]	16	41	21	32	87	65	0	1	1	8	3	14
Wisconsin	5	2	1	28	30	34	1	0	1	0	1	1
W. NO. CEN.												
Minnesota	14	5	5	10	18	19	0	0	0	1	3	1
Iowa	5	25	2	9	16	15	1	2	2	4	1	3
Missouri	4	11	1	8	1	13	4	0	2	22	6	22
North Dakota	0	4	0	1	2	2	0	0	1	0	0	0
South Dakota	0	3	1	2	5	7	0	0	0	0	0	1
Nebraska	0	2	1	1	0	4	0	0	0	0	3	1
Kansas	1	30	3	12	21	21	0	0	0	2	4	4
SO. ATL.												
Delaware	2	0	0	0	1	1	0	0	0	0	2	1
Maryland [2 3]	16	0	1	7	8	9	0	0	0	4	5	9
Dist. of Col. [3]	8	0	3	7	2	2	0	0	0	0	1	3
Virginia [2]	7	9	1	15	6	6	0	0	0	8	9	18
West Virginia [3]	0	31	2	11	12	11	0	0	0	12	15	15
North Carolina	16	3	5	16	14	19	0	0	0	13	11	22
South Carolina [4]	11	0	0	4	2	1	2	0	0	20	14	14
Georgia [4]	69	1	2	6	9	9	0	0	0	11	24	24
Florida [4]	10	2	3	0	0	0	0	0	0	1	0	1
E. SO. CEN.												
Kentucky	15	19	4	7	15	21	0	0	0	23	19	41
Tennessee	37	3	3	7	15	15	1	0	0	13	21	30
Alabama [4]	82	3	3	12	12	12	0	1	0	2	13	17
Mississippi [3 4]	11	0	2	4	0	2	0	0	0	23	14	7
W. SO. CEN.												
Arkansas	4	2	1	2	11	6	0	0	0	14	13	18
Louisiana [4]	3	4	2	3	5	5	0	0	0	15	36	21
Oklahoma	0	9	1	3	7	6	0	0	0	9	27	27
Texas [4]	3	8	8	11	17	17	0	0	0	46	75	56
MOUNTAIN												
Montana [2]	1	7	0	10	4	8	0	0	0	0	0	2
Idaho	0	0	0	3	1	1	0	0	0	1	0	2
Wyoming [2]	1	0	0	0	0	0	0	0	0	0	0	0
Colorado	0	0	2	2	10	10	0	1	0	3	2	1
New Mexico	0	1	1	3	1	4	0	0	0	10	2	5
Arizona	0	0	0	0	0	1	0	0	0	2	0	2
Utah [3]	3	1	0	2	5	5	0	0	0	0	1	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	4	13	3	18	8	8	0	0	0	3	4	4
Oregon	3	4	2	4	5	8	0	0	0	5	0	2
California	5	23	23	44	50	51	0	0	1	9	4	11
Total	549	391	343	524	692	732	12	6	30	353	401	554
33 weeks	2,822	2,072	2,072	91,895	118,887	137,185	1,190	1,958	7,974	4,496	4,993	7,105

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 16, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Aug. 16, 1941	Aug. 17, 1940	Division and State	Whooping cough, Week ended— Aug. 16, 1941	Aug. 17, 1940
NEW ENG.			SO. ATL.—continued		
Maine	18	34	South Carolina [4]	74	13
New Hampshire	0	0	Georgia [4]	19	8
Vermont	0	21	Florida [4]	3	3
Massachusetts	148	142	E. SO. CEN.		
Rhode Island	13	0	Kentucky	46	85
Connecticut	20	32	Tennessee	67	47
MID. ATL.			Alabama [4]	14	15
New York	214	298	Mississippi [3, 4]		
New Jersey	124	88	W. SO. CEN.		
Pennsylvania [2]	178	348	Arkansas	22	11
E. NO. CEN.			Louisiana [4]	11	8
Ohio [2]	247	310	Oklahoma	18	4
Indiana [2]	15	9	Texas [4]	132	202
Illinois	181	155	MOUNTAIN		
Michigan [3]	242	275	Montana [2]	23	17
Wisconsin	214	98	Idaho	8	5
W. NO. CEN.			Wyoming [2]	24	8
Minnesota	52	42	Colorado	109	18
Iowa	60	20	New Mexico	50	45
Missouri	85	11	Arizona	33	7
North Dakota	22	23	Utah [3]	56	64
South Dakota	5	7	Nevada	1	
Nebraska	8	2	PACIFIC		
Kansas	84	55	Washington	86	59
SO. ATL.			Oregon	22	18
Delaware	4	7	California	332	326
Maryland [2, 3]	56	123	Total	3,383	3,295
Dist. of Col.[3]	9	12	33 weeks	146,779	107,172
Virginia [3]	38	71			
West Virginia [3]	43	69			
North Carolina	203	90			

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended Aug. 16, 1941, 19 cases as follows: Pennsylvania, 3; Ohio, 2; Indiana, 1; Maryland, 8; District of Columbia, 1; Virginia, 2; Montana, 1; Wyoming, 1.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended Aug. 16, 1941, 166 cases as follows: South Carolina, 1; Georgia, 24; Florida, 3; Alabama, 8; Mississippi, 1; Louisiana, 6; Texas, 123.

PLAGUE INFECTION IN CALIFORNIA AND MONTANA

IN FLEAS FROM GROUND SQUIRRELS AND BURROWS IN SISKIYOU COUNTY, CALIF.

Under date of August 8, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 300 fleas from 10 ground squirrels, *C. douglasii*, submitted to the laboratory on July 11 from a ranch 8 miles east and 3 miles south of Montague; in a pool of 143 fleas from burrows and another pool of 34 fleas from 3 ground squirrels, *C. douglasii*, collected on July 12 on a ranch 8½ miles east and 3 miles south of Montague, Siskiyou Co., Calif.

IN GROUND SQUIRRELS IN RAVALLI COUNTY, MONT.

Under date of August 4, 1941, plague infection was reported found, upon examination at the laboratory in San Francisco, in tissue from each of 2 ground squirrels found dead on July 18 at a location 5 miles north of Sula, west of Highway No. 93, in Ravalli Co., Mont.

WEEKLY REPORTS FROM CITIES

City reports for week ended August 2, 1941

This table summarizes the reports received weekly from 135 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 89 selected cities:											
5-year average	71	25	10	510	267	247	4	339	63	1,380	--------
Current week	52	36	5	412	298	210	1	364	55	1,251	--------
Maine:											
Portland	0	------	0	0	0	0	0	0	0	8	15
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	4
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Burlington	0	------	0	1	0	0	0	0	0	1	9
Rutland	0	------	0	0	1	0	0	0	0	0	8
Massachusetts:											
Boston	0	------	0	25	7	26	0	7	1	44	178
Fall River	1	------	0	1	0	0	0	2	0	8	32
Springfield	0	------	0	11	0	1	0	0	0	11	29
Worcester	0	------	0	0	2	0	0	0	0	15	53
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	10
Providence	1	------	0	10	1	0	0	0	0	22	55
Connecticut:											
Bridgeport	0	------	0	6	1	1	0	0	0	2	22
Hartford	0	------	0	0	5	0	0	0	0	1	38
New Haven	0	------	0	3	1	0	0	1	0	6	39
New York:											
Buffalo	0	------	1	6	8	1	0	9	0	5	147
New York	14	1	1	41	37	32	0	82	8	109	1,238
Rochester	0	------	0	8	0	0	0	0	1	5	76
Syracuse	0	------	0	10	0	0	0	1	0	18	43
New Jersey:											
Camden	0	------	0	0	1	0	0	0	0	1	34
Newark	0	------	0	3	13	5	0	3	0	14	80
Trenton	0	------	0	0	2	1	0	2	0	0	39
Pennsylvania:											
Philadelphia	0	1	0	6	20	12	0	28	3	29	450
Pittsburgh	0	------	0	15	12	4	0	9	3	47	174
Reading	0	------	0	0	1	0	0	2	1	0	21
Scranton	0	------	--------	5	-------	0	0	-------	0	1	--------
Ohio:											
Cincinnati	0	------	0	0	0	5	0	8	0	5	180
Cleveland	0	1	0	0	7	10	0	8	1	61	187
Columbus	0	------	0	3	2	4	0	4	0	17	88
Toledo	0	-----	0	32	5	2	0	5	0	73	107
Indiana:											
Anderson	0	------	0	4	1	0	0	0	0	0	7
Fort Wayne	0	------	0	1	3	0	0	0	1	4	35
Indianapolis	0	------	0	10	14	3	1	6	1	1	162
Muncie	0	------	0	0	2	0	0	0	0	0	16
South Bend	0	------	0	3	0	0	0	0	0	1	18
Terre Haute	1	------	0	0	2	0	0	0	0	0	24
Illinois:											
Alton	0	------	0	0	2	0	0	0	0	0	12
Chicago	10	------	1	16	28	17	0	40	1	92	865
Elgin	0	------	0	0	0	1	0	0	0	1	11
Moline	0	------	0	0	0	0	0	0	0	6	10
Springfield	0	------	0	1	3	0	0	0	0	0	23
Michigan:											
Detroit	0	------	0	22	9	18	0	13	1	76	285
Flint	0	------	0	1	5	1	0	0	0	1	28
Grand Rapids	0	------	0	3	0	0	0	0	1	4	28
Wisconsin:											
Kenosha	0	------	0	1	0	1	0	0	0	1	12
Madison	0	------	0	4	0	0	0	0	0	1	9
Milwaukee	0	------	0	40	3	9	0	2	0	108	115
Racine	0	------	0	17	0	1	0	0	0	1	15
Superior	0	------	0	1	0	4	0	0	0	5	11
Minnesota:											
Duluth	0	------	0	0	1	0	0	1	0	7	21
Minneapolis	0	------	0	0	3	2	0	3	0	13	168
St. Paul	0	------	0	0	6	1	0	2	0	13	76

City reports for week ended August 2, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			1		0	0		0	0	
Davenport	0			0		0	0		0	0	
Des Moines	0			1		0	0		0	8	44
Sioux City	0			0		0	0		0	8	
Waterloo	0			0		0	0		0	0	
Missouri:											
Kansas City	0		0	0	5	1	0	6	1	6	108
St. Joseph	0		1	2	2	1	0	1	0	0	22
St. Louis	2		0	7	4	8	0	9	3	35	248
North Dakota:											
Fargo	0		0	0	0	1	0	0	0	11	13
Grand Forks	0			1		0	0		0	1	
Minot	0		0	4	0	0	0	0	0	2	8
South Dakota:											
Aberdeen	1			0		0	0		0	0	
Sioux Falls	0			0		0	0		0	0	8
Nebraska:											
Lincoln	0			1		0	0		0	3	
Omaha	0		0	0	0	1	0	1	0	2	69
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	6	3
Topeka	0		0	2	2	0	0	0	0	21	15
Wichita	0		0	0	3	3	0	1	0	4	32
Delaware:											
Wilmington	0		0	2	1	0	0	1	0	0	19
Maryland:											
Baltimore	0		0	58	4	13	0	10	3	55	232
Cumberland	3		0	0	0	0	0	0	0	0	11
Frederick	0		0	0	0	0	0	0	0	0	0
Dist. of Col.:											
Washington	0		0	11	6	2	0	17	0	20	169
Virginia:											
Lynchburg	0		0	10	0	0	0	0	0	4	11
Norfolk	0		0	1	1	0	0	2	0	1	35
Richmond	2		0	0	2	1	0	3	1	0	50
Roanoke	0		0	1	0	0	0	0	0	2	22
West Virginia:											
Charleston	0		0	1	2	1	0	0	0	1	29
Huntington	0			0		0	0		0	0	
Wheeling	0		0	0	1	0	0	0	2	1	20
North Carolina:											
Gastonia	0			0		0	0		0	0	
Raleigh	0		0	1	4	0	0	2	0	10	25
Wilmington	0		0	2	2	0	0	0	0	17	13
Winston-Salem	1		0	0	0	0	0	2	0	5	12
South Carolina:											
Charleston	0		0	0	0	0	0	1	0	4	21
Florence	0			0		0	0		0	1	
Greenville	0		0	0	0	0	0	0	0	4	3
Georgia:											
Atlanta	0	2	0	0	3	2	0	8	0	3	87
Brunswick	0		0	0	0	0	0	0	0	0	4
Savannah	0		0	3	1	0	0	1	1	3	40
Florida:											
Miami	0		0	1	1	1	0	2	0	5	33
St. Petersburg	0		0	0	2	0	0	1	0	1	22
Tampa	0		0	0	3	0	0	1	1	1	37
Kentucky:											
Ashland	0		0	0	1	0	0	0	0	0	9
Covington	0		0	0	0	1	1	0	0	0	20
Lexington	0		0	0	0	0	0	0	0	6	13
Louisville	1		0	8	4	4	0	5	1	27	56
Tennessee:											
Knoxville	0		0	2	0	2	0	1	0	0	25
Memphis	0	9	0	1	4	0	0	7	0	17	59
Nashville	0		0	2	0	0	0	3	9	13	49
Alabama:											
Birmingham	1	1	0	0	3	0	0	4	0	3	76
Mobile	0	1	0	0	0	0	0	1	1	0	20
Montgomery	0			1		2	0		0	0	
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0		0	1	3	0	0	1	0	2	24
Louisiana:											
Lake Charles	0		0	1	0	0	0	0	0	0	3
New Orleans	0	1	0	0	16	0	0	7	3	17	140
Shreveport	1		0	0	3	0	0	2	1	0	26

City reports for week ended August 2, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	1	0	0	3	0	0	2	1	0	44
Tulsa	0	5	0	0	1	2	0	0	1	3	18
Texas:											
Dallas	4	------	0	5	0	5	0	3	1	11	63
Fort Worth	0	------	0	2	2	1	0	0	1	0	32
Galveston	0	------	0	0	1	0	0	0	0	0	13
Houston	2	------	0	9	8	1	0	9	0	5	115
San Antonio	0	------	0	0	4	0	0	10	0	2	76
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	9
Great Falls	0	------	0	0	1	0	0	0	0	6	7
Helena	0	------	0	0	0	0	0	0	0	0	2
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	8
Colorado:											
Colorado Springs	0	------	0	18	0	0	0	2	0	4	6
Denver	5	10	0	3	2	1	0	3	0	73	66
Pueblo	0	------	0	1	0	0	0	1	0	7	9
New Mexico:											
Albuquerque	0	------	0	1	0	0	0	3	2	4	14
Arizona:											
Phoenix	0	9	--------	2	--------	0	0	--------	0	6	--------
Utah:											
Salt Lake City	0	------	0	0	0	0	0	0	0	14	19
Washington:											
Seattle	0	------	0	1	3	0	0	5	4	24	82
Spokane	0	------	0	1	1	1	0	0	0	10	30
Tacoma	0	------	0	1	0	1	0	0	0	10	31
Oregon:											
Portland	0	------	0	1	0	3	0	0	0	1	65
Salem	0	------	--------	0	--------	0	0	--------	0	0	--------
California:											
Los Angeles	4	9	1	15	2	5	0	11	1	52	280
Sacramento	2	------	0	2	1	1	0	0	0	11	28
San Francisco	0	------	0	6	3	2	0	0	0	14	143

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Minnesota:			
Springfield	1	0	0	Minneapolis	1	0	0
Rhode Island:				St. Paul	0	0	1
Providence	0	0	1	Iowa:			
Connecticut:				Des Moines	0	0	1
Hartford	0	0	1	Missouri:			
New York:				St. Joseph	1	0	0
Buffalo	3	2	0	Maryland:			
New York	2	1	3	Baltimore	0	0	9
Pennsylvania:				South Carolina:			
Philadelphia	1	0	4	Charleston	0	0	1
Pittsburgh	0	0	1	Georgia:			
Ohio:				Atlanta	0	0	6
Cincinnati	0	0	1	Savannah	0	0	3
Cleveland	0	0	16	Tennessee:			
Indiana:				Nashville	0	0	6
Indianapolis	0	0	2	Alabama:			
Illinois:				Birmingham	0	0	5
Chicago	1	0	1	Mobile	0	0	1
Michigan:				Louisiana:			
Detroit	1	0	6	New Orleans	0	0	3
Wisconsin:				Shreveport	0	0	2
Milwaukee	0	0	1				
Superior	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: Pittsburgh, 1; Cleveland, 1; Chicago, 1; St. Paul, 1; St. Louis, 1; Fargo, 9; Grand Forks, 5; Minot, 9; Aberdeen, 2; Omaha, 4; Wichita, 1; Fort Worth, 1; Denver, 1; Albuquerque, 1. Deaths: Cleveland, 1; Chicago, 1; St. Louis, 1; Fargo, 3; Wichita, 1.

Pellagra.—Cases: Birmingham, 1; Dallas, 1.

Typhus fever.—Cases: New York, 2; Brunswick, 1; Savannah, 4; Miami, 3; Birmingham, 3; Dallas 1; Fort Worth, 2; Houston, 1; Los Angeles, 1.

TERRITORIES AND POSSESSIONS

PANAMA CANAL ZONE

Notifiable diseases—April–June 1941.—During the months of April, May, and June 1941, certain notifiable diseases were reported in the Panama Canal Zone, including the terminal cities, as follows:

Disease	April		May		June	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	13		18		6	
Diphtheria	5	1	3		7	2
Dysentery (amoebic)	5	1	5		5	1
Leprosy	2		1			
Malaria	151	4	187	2	347	8
Measles	107		102		115	
Meningitis, meningococcus	1		2		1	1
Mumps	1					
Paratyphoid fever			3		2	
Pneumonia	[1] 15	8	[1] 13	37	[1] 15	15
Relapsing fever					2	
Tuberculosis	[1] 8	35	[1] 6	42	[1] 3	33
Typhoid fever			2	1		
Typhus fever	2					
Whooping cough	3		[1] 1			

[1] In the Canal Zone only.

VIRGIN ISLANDS

Notifiable diseases—April–June 1941.—During the months of April, May, and June 1941, cases of certain notifiable diseases were reported in the Virgin Islands of the United States as follows:

Disease	April	May	June
Dengue	2	2	20
Filariasis	1	8	7
Gonorrhea	21	6	4
Hookworm disease	2	4	4
Malaria	4	1	
Pneumonia	1		
Syphilis	21	15	14
Tuberculosis	10	1	

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 12, 1941.—During the week ended July 12, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	2	2	------	6	------	2	1	------	14
Chickenpox	------	28	------	9	126	13	12	46	17	251
Diphtheria	------	9	1	5	4	------	1	------	------	20
Dysentery	------	------	------	7	2	------	------	------	------	9
Influenza	------	1	------	------	7	------	------	------	28	36
Measles	------	------	------	38	309	17	16	4	32	416
Mumps	------	------	------	18	61	13	------	2	4	98
Pneumonia	------	1	------	------	8	1	------	1	4	15
Poliomyelitis	------	------	1	1	2	17	1	------	1	23
Scarlet fever	------	5	1	50	92	7	1	7	7	170
Tuberculosis	------	19	10	87	47	36	21	1	------	221
Typhoid and paratyphoid fever	------	------	------	31	5	1	------	------	1	38
Whooping cough	------	------	------	74	127	2	------	5	40	248

Manitoba—Poliomyelitis.—During the week ended August 15, 1941, 147 cases of poliomyelitis were reported in the Province of Manitoba, making a total of 435 cases during the present outbreak. Approximately one-third of the cases have been reported from Greater Winnipeg, but the epidemic has now spread to 28 municipalities outside of the city, with occasional cases reported in sparsely populated areas of the Province. The disease continues to be of mild type, with comparatively few deaths and paralysis in less than 25 percent of the cases. The total number of cases to date is about the same as in the 1928 epidemic and about 100 less than in the serious outbreak of 1936.

Encephalitis.—Concurrently (during the same week), 22 cases of encephalitis were reported from widely separated localities in Manitoba, the majority being reported in the southern part of the Province, bordering on the States of North Dakota and Minnesota, where an outbreak of the disease is occurring at the present time.[1]

[1] See p. 1713.

402840°—41——4

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Indochina (French)—Saigon.—For the week ended August 2, 1941, 1 case of plague was reported in Saigon, French Indochina.

Peru—Moquegua Department—Ilo.—For the period June 1–30, 1941, 3 cases of plague with 1 death were reported in the port of Ilo, Moquegua Department, Peru.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Boyaca Department, July 8, 1941, 1 death; Intendencia of Meta, June 27, 1941, 1 death; Santander Department, June 27, 1941, 1 death.

Ivory Coast—Dimbokro.—On August 7, 1941, 1 fatal case of yellow fever was reported in Dimbokro, Ivory Coast.

×

Public Health Reports

VOLUME 56 AUGUST 29, 1941 NUMBER 35

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE 1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • AUGUST 29, 1941 • *No. 35*

THE SPECIFICITY OF THE COMPLEMENT FIXATION TEST IN ENDEMIC TYPHUS FEVER USING A RICKETTSIAL ANTIGEN [1]

By IDA A. BENGTSON, *Senior Bacteriologist*, and NORMAN H. TOPPING, *Passed Assistant Surgeon, United States Public Health Service*

It was reported recently (*1*) that the complement fixation test could be used in determining past infection with endemic typhus fever, as well as recent infection, using a rickettsial antigen. The specificity of the test was studied in relation to other rickettsial diseases, including Rocky Mountain spotted fever, "Q" fever, and European typhus. In this report the specificity of the test is further considered; serums have been tested from more cases of endemic typhus fever and from cases of other diseases.

The endemic typhus serums were from cases which occurred in Alabama and Georgia, and the strain had been isolated and proved in 15 of the cases. In 37 others the diagnosis was based on clinical symptoms.

Other diseases from which serums were obtained include tuberculosis, leprosy, malaria, syphilis, lymphopathia venereum, typhoid fever, amebiasis, trachoma, rheumatic fever, undulant fever, and tularemia. Patients from whom many of the specimens were obtained were in the marine hospitals in Norfolk, Va., and Baltimore, Md., the National Leprosarium in Carville, La., St. Elizabeths Hospital in Washington, D. C., and the trachoma hospitals in Richmond, Ky., and Rolla, Mo. The serums from these cases were from freshly drawn blood. In addition, tests were made on a number of serums which had been received at the National Institute of Health for agglutination tests. Some of these were of recent origin, but most of them had been stored at refrigerator temperature for periods of 1 to 24 months. Among these were serums from cases of undulant fever, tularemia, and rheumatic fever. Typhoid serums were obtained from the Hygienic Laboratory of the Arkansas State Board of Health.

Procedure.—The antigen was prepared from yolk sacs infected with the wild rat strain of endemic typhus fever referred to in the previous publication (*1*). After several passages of the virus by inoculation into the yolk of 6-day chick embryos, the yolk sacs were very heavily

[1] From the Division of Infectious Diseases, National Institute of Health

infected. These were macerated after draining to free from excess yolk, and suspended in 0.85 percent salt solution containing 1:10,000 merthiolate to a concentration of 10 percent. The suspension was centrifuged lightly to precipitate the large particles. The supernatant fluid was then centrifuged in an angle centrifuge at 4,000 revolutions per minute for 1 hour. The precipitate was removed and suspended in 0.85 percent sterile saline with merthiolate, to the original volume. The suspensions of rickettsiae remained in the refrigerator for periods varying from 1 to several weeks, during which time more tissue precipitated and the rickettsiae remained in suspension. Titrations of the antigen with known human and guinea pig serums showed 4+ fixation in dilution of 1: 8, and this dilution was used in all tests.

The test was carried out as previously described (*1*), 0.2 cc. amounts of inactivated serum in dilutions ranging from 1: 2 to 1: 64 or higher, 0.2 cc. amounts of antigen, and 0.2 cc. amounts of complement being mixed and incubated for 1 hour at 37° C., after which 0.4 cc. of sensitized sheep cells were added and incubation continued for another hour.

Results.—The results obtained with the typhus serums are shown in table 1. The complement fixation and the Weil-Felix titers are shown in parallel columns. Fixation to 3+ or 4+ in the dilutions indicated was considered as the titer of the serum. Likewise, in the Weil-Felix test agglutination to 3+ or 4+ in the dilutions indicated was considered as the titer of the serums tested. The date of illness and the method of diagnosis are shown. Table 2 summarizes the results obtained with all the other serums tested.

DISCUSSION

Among the 15 proved cases of endemic typhus all serums were positive in dilutions of 1: 4 to 1: 1,024. These were cases in which typhus fever had occurred from 2 months to 6 years previously. Fourteen were positive in dilutions of 1: 8 or over, while 1 was positive in a dilution of 1: 4. The 2 cases which were of the most recent origin (2 months) were positive in dilutions of 1: 512 and 1: 1,024, while the one of earliest origin (67 months) had a titer of 1: 16. The 3 with the lowest titers (1: 4 and 1: 8) had had the disease 23 months, 36 months, and 39 months previously.

There were 37 serums from cases diagnosed as endemic typhus fever from the clinical symptoms, although a few of these were cases which had not actually been reported as typhus fever. All of the patients had had the disease in 1940 with the exception of No. 41 who had had it 3 years previously. Thirty-two of the serums had titers ranging from 1: 8 to 1: 1,024. Five serums had titers below 1: 8 (2 had a titer of 1: 2 and 3 had 1: 4). It is of interest that such a high percentage of the cases were correctly diagnosed as indicated by the results of the complement fixation test, although it is to be considered that the cases

occurred in an area where the disease is endemic. Possibly some of those with the low titers were incorrectly diagnosed.

There is a certain correlation between the titer of the serum and the length of time elapsing between the date of illness and the time of testing the serum, higher titers being evident, in general, during the first few months after illness, although the irregularities suggest some relationship of the titer to the severity of the illness.

TABLE 1.—*Typhus serums*

Serum No.	Patient's name	Date of typhus	Status of diagnosis	Complement fixation titer	Weil-Felix titer (X_{19})
1	W.D.C	Sept. 14, 1935	Strain isolated	1:16	1:10
2	G.S.	Dec. 9, 1936	do	1:32	1:40
3	L.J.	May 18, 1937	do	1:32	1:20
4	R.H.	Sept. 25, 1939	do	1:128	1:20
5	R.W.	June 19, 1939	do	1:64	1:40
6	J.B.C.	Oct. 11, 1940	do	1:256	1:20
7	R.R.	July 13, 1938	do	1:8	1:20
8	J.H.W.	Apr. 21, 1938	do	1:4	1:10
9	D.W.R.	Sept. 10, 1938	do	1:32	1:20
10	E.W.	June 11, 1940	do	1:64	1:20
11	J.B.	Feb. 7, 1939	do	1:64	1:20
12	T.L.J.	May 20, 1939	do	1:8	1:160
13	G.W.B.	June 20, 1940	do	1:64	0
14	D.B.	Jan. 27, 1940	Clinical diagnosis	1:16	1:10
15	E.S.M.	June 8, 1940	do	1:4	1:40
16	H.W.S.	Jan. 20, 1940	do	1:128	1:80
17	W.R.Y.	Nov. 2, 1940	do	1:256	1:160
18	A.G.	Oct. 27, 1940	do	1:64	1:20
19	R.B	Aug. 24, 1940	do	1:64	1:10
20	M.K.	Oct. 26, 1940	do	1:256	1:1,280
21	M.M.	July 20, 1940	do	1:256	1:80
22	H E.	June 1, 1940	do	1:256	1:20
23	M.D.	Nov. 30, 1940	do	1:256	1:10
24	R.R.	Aug. 24, 1940	do	1:64	1:40
25	M. A.	Sept. 14, 1940	do	1:128	1:160
26	M. R.	Nov. 16, 1940	do	1:8	1:80
27	S. B.	Nov. 9, 1940	do	1:32	1:80
28	Mrs. W. S.	Nov. 2, 1940	do	1:256	1:80
29	J. J.	Jan. 13, 1940	do	1:64	1:20
30	T. C.	Aug. 3, 1940	do	1:64	1:20 (2+)
31	J. B. D.	Sept. 21, 1940	do	1:32	1:20 (2+)
32	G. G.	Jan. 6, 1940	do	1:64	1:80
33	M. J.	Oct. 12, 1940	do	1:256	1:20
34	E. L.	Nov. 9, 1940	do	1:256	1:40
35	Mrs. E. B. S.	Oct. 12, 1940	do	1:4	1:160
36	M. S.	Sept. 21, 1940	do	1:64	1:10 (2+)
38	A. A.	Sept. 28, 1940	do	1:32	1:40
39	Mrs. A. S.	1940, not reported	do	1:128	1:10
40	T. M. A.	1940, not reported	do	1:256	1:40
41	J. D. A.	3 years ago, reported (?)	do	1:8	1:10 (2+)
42	R. W.	1940, not reported (?)	do	1:64	1:160
43	F. E. G.	Nov. 9, 1940	do	1:128	1:320
44	Mrs. E. R.	Nov. 30, 1940	do	1:16	1:320
45	Mrs. P. L.	Oct. 27, 1940	do	1:256	1:20
46	Mrs. A. H.	July 20, 1940	do	1:2	1:10 (2+)
47	E. G. P.	Feb. 8, 1941	Strain isolated	1:1,024	1:1,280
48	W. B. G.	Feb. 8, 1941	do	1:512	1:40
49	E. B. W.	July 27, 1940	Clinical diagnosis	1:64	1:40
50	Mrs. A. A. M.	1940, not reported	do	1:2	1:10
51	Dr. W. A. M.	do	do	1:4	1:10
52	R. T.	Nov. 6, 1940	do	1:256	1:320
53	W. A. S.	1940	do	1:64	1:10 (2+)

The Weil-Felix titer of the serums from most of the cases which had occurred a year or more prior to the date of obtaining the blood for the test had decreased to a low point (1:40 or lower). In only 2 cases was the titer higher than 1:40 (No. 12, 25 months, titer 1:160, and No. 32, 15 months, titer 1:80). The corresponding complement

fixation titers were 1:8 and 1:64. Also, many of the serums obtained less than a year after illness had low Weil-Felix titers (e. g., No. 6, 6 months after illness, complement fixation titer 1:256, Weil-Felix titer 1:20; No. 13, 10 months after illness, complement fixation titer 1:64, Weil-Felix titer 0). On the other hand, there was a certain correlation in a number of the serums in this group (e. g., No. 47, 2 months after illness, complement fixation titer 1:1,024, Weil-Felix titer 1:1,280; No. 20, 6 months after illness, complement fixation titer 1:256, Weil-Felix titer 1:1,280; No. 15, 10 months after illness, complement fixation titer 1:4, Weil-Felix titer 1:40). More detailed studies are suggested to determine further the relationship of the complement fixation to the Weil-Felix test.

TABLE 2.—*Serums from other diseases*

Number of specimens	Disease	Complement fixation	Remarks
14	Tuberculosis	0	
10	Leprosy	0 to very slight	7 fixed complement in dilution 1:2 (1+ or 2+).
6	Malaria	0	2 cases active; 2 cases cured; 2 cases with tabes dorsalis.
10	Syphilis	0	3 cases primary; 3 cases secondary; 4 cases tertiary.
10	Rheumatic fever	0	
7	Undulant fever	0 to very slight	6 fixed complement in dilutions 1:2 to 1:4 (1+ or 2+). Titers against abortus antigen were 1:160 to 1:5120.
13	Tularemia	0 to very slight	7 fixed complement in dilutions 1:2 to 1:8 (1+ or 2+). Titers against tularense antigen were 1:8 to 1:1280.
8	Typhoid fever	0	
9	Trachoma	0	3 cases, stage IIa; 2 cases, stage IIb; 3 cases, stage III; 1 case, stage IV.
2	Lymphopathia venereum.	0	
1	Psittacosis	0	
2	Amebiasis	0	

The results obtained with serums from patients with other diseases point to rather definite specificity of the test. Seven of the 10 leprosy serums tested showed slight fixation in the 1:2 dilution, which is probably of no significance. Serums from patients infected with the tubercle bacillus, another acid-fast organism, were completely negative.

Serums from 10 syphilis cases, including primary, secondary, and tertiary cases, were all negative. Among the virus diseases 2 specimens from lymphopathia venereum, 1 from psittacosis, and 9 from trachoma were all negative. Serums from 2 cases of amebiasis were negative. Specimens from 6 cases of malaria, 2 active, 2 cured, and 2 with tabes dorsalis, all gave negative results.

The 7 specimens from undulant fever and the 13 specimens from tularemia which gave positive readings with abortus and tularense antigens in the agglutination test and which had been stored in the refrigerator for periods up to 24 months were negative in the complement fixation test except that some fixation was obtained in low dilutions (1:4 and once 1:8), but this fixation was never more complete than 2+. A number of these serums were slightly anticomplementary, probably owing to the considerable period of storage in some cases.

SUMMARY

The complement fixation test for endemic typhus fever has been shown to be specific by comparing the results obtained using serums from known proved cases of endemic typhus fever and from cases diagnosed clinically as endemic typhus with those obtained using serums from cases of syphilis, leprosy, tuberculosis, rheumatic fever, malaria, undulant fever, tularemia, trachoma, and a few specimens from miscellaneous diseases including lymphopathia venereum, psittacosis, and amebiasis.

ACKNOWLEDGMENT

The authors acknowledge with thanks the assistance of the Georgia State Board of Health and the Savannah City Health Department in obtaining the specimens of serums from the cases of endemic typhus fever.

REFERENCE

(*1*) Bengtson, Ida: Complement fixation in endemic typhus. Pub. Health Rep., **56**: 649–653 (1941).

STUDIES OF SEWAGE PURIFICATION [1]

XIV. THE ROLE OF *SPHAEROTILUS NATANS* IN ACTIVATED SLUDGE BULKING

By C. C. Ruchhoft, *Principal Chemist*, and John F. Kachmar, *Junior Chemist*, *United States Public Health Service, Stream Pollution Investigations, Cincinnati, Ohio*

INTRODUCTION

The bulking of activated sludge has received the attention of sanitary engineers and chemists ever since the development of the process to large scale operation. Bulking has been considered the result of several different causes. In a recent excellent paper Heukelekian and Ingols (*1*) divide bulking into two general classes—carbohydrate bulking and sewage bulking. They studied seven

[1] Previous articles in this series are:

Theriault, E. J., and McNamee, P. D.: Studies of sewage purification: I. Apparatus for the determination of dissolved oxygen in sludge-sewage mixtures. Pub. Health Rep., 50: 480 (1935). (Reprint No. 1680.)

Butterfield, C. T.: Studies of sewage purification. II. A zoogleal-forming bacterium isolated from activated sludge. Pub. Health Rep., 50: 671 (1935). (Reprint No. 1686.)

Theriault, E. J.: Studies of sewage purification. III. The clarification of sewage. A review. Sewage Works J., 7: 377 (1935). Also, Pub. Health Rep., 50: 1581 (1935). (Reprint No. 1715.)

Smith, Russell S., and Purdy, W. C.: Studies of sewage purification. IV. The use of chlorine for the correction of sludge bulking in the activated sludge process. Sewage Works J., 8: 223–230 (1936). Pub. Health Rep., 51: 617 (1936). (Reprint No. 1746.)

McNamee, P. D.: Studies of sewage purification. V. Oxidation of sewage by activated sludge. Sewage Works J., 8: 562 (1936). Pub. Health Rep., 51: 1034 (1936). (Reprint No. 1774.)

Butterfield, C. T., Ruchhoft, C. C., and McNamee, P. D.: Studies of sewage purification. VI. Biochemical oxidation by sludges developed by pure cultures of bacteria isolated from activated sludge. Sewage Works J., 9: 173 (1937). Pub. Health Rep., 52: 387 (1937). (Reprint No. 1812.)

Footnote 1 continued on p. 1728.

factors that were involved, including oxygen supply, food concentration, sludge concentration, sludge condition, carbon to nitrogen ratio, temperature, and nitrates. Bulking, they said, was induced by an excessive development of sludge or certain organisms comprising the sludge, due to the improper balance of food in relation to sludge. These authors stressed aeration rate as an important factor in this phenomenon.

One variety of bulking is commonly associated with excessive growths of *Sphaerotilus natans*. When this type of bulking occurs, carbohydrates are often found in the sewage influent. Lackey and Wattie (*2*), in a previous paper of this series, reviewed instances of activated sludge bulking in which *Sphaerotilus natans* was considered the causative agent, and presented the biology of this organism. The limits of nutrient elements requisite for the growth of *Sphaerotilus natans* were determined, and in an extensive search no substance was found, common or apt to occur in sewage, which stimulated the organism to excessive growth. These investigators found *Sphaerotilus natans* to be a strict aerobe. Littman (*3*) has contributed a study of the carbon and nitrogen transformations of sewage by *Sphaerotilus*. He found that a concentration of 757 p. p. m. of *Sphaerotilus*, dosed with sterile sewage and aerated, removed a maximum of 56 percent of the 5-day B. O. D. of the sewage after 4 hours and also determined the carbon dioxide produced. He concluded that the *Sphaerotilus* sludge produced had high sludge indices, exerted a moderate purifying action on sewage, and that certain types of bulking appeared to be the result of the overgrowth of activated sludge by these organisms.

The view that carbohydrates are specific stimulants in inducing bulking is quite common. Ingols and Heukelekian (*4*) expressed the view that glucose stimulates *Sphaerotilus natans* to a greater extent than zoogleal bacteria even under aerobic conditions. Ingols

---

(Footnote 1 continued from page 1727)

Ruchhoft, C. C., McNamee, P. D., and Butterfield, C. T.: Studies of sewage purification. VII. Biochemical oxidation by activated sludge. Sewage Works J., 10: 661 (1938). Pub. Health Rep., 53: 1690–1718 (1938). (Reprint No. 1987.)

Butterfield, C. T., and Wattie, Elsie: Studies of sewage purification. VIII. Observations on the effect of variations in the initial numbers of bacteria and of the dispersion of sludge flocs on the course of oxidation of organic material by bacteria in pure culture. Pub. Health Rep., 53: 1912 (1938). (Reprint No. 1999.)

Ruchhoft, C. C., Butterfield, C. T., McNamee, P. D., and Wattie, Elsie: Studies of sewage purification. IX. Total purification, oxidation, adsorption, and synthesis of nutrient substrates by activated sludge. Sewage Works J., 11: 195 (1939). Pub. Health Rep., 54: 468 (1939). (Reprint No. 2040.)

Ruchhoft, C. C., and Smith, R. S.: Studies of sewage purification. X. Changes in characteristics of activated sludge induced by variations in applied load. Sewage Works J., 11: 409 (1939). Pub. Health Rep., 54: 924 (1939). (Reprint No. 2074.)

Ruchhoft, C. C., Kachmar, J. F., and Moore, W. A.: Studies of sewage purification. XI. The removal of glucose from substrates by activated sludge. Sewage Works J., 12: 27 (1940). Pub. Health Rep., 55: 393 (1940). (Reprint No. 2142.)

Ruchhoft, C. C., Kachmar, J. F., and Placak, O. R.: Studies of sewage purification. XII. Metabolism of glucose by activated sludge. Pub. Health Rep., 55: 582–601 (1940). (Reprint No. 2149.)

Lackey, James B., and Wattie, Elsie: Studies of sewage purification. XIII. The biology of *Sphaerotilus natans* Kutzing in relation to bulking of activated sludge. Pub. Health Rep., 55: 975–988 (1940). (Reprint No 2166.)

(*5*) not only considers *Sphaerotilus natans* as a facultative anaerobe but concludes that *Sphaerotilus natans* grows much more rapidly with less oxygen. The physiology of both *Sphaerotilus natans* and zoogleal bacteria should be very carefully studied so that our understanding of the causes and cure for *Sphaerotilus* overgrowths and bulking difficulties will be sound. In this paper, therefore, we have studied the growth and metabolic response of *Sphaerotilus natans* to carbohydrates under aerobic and anaerobic conditions. While to some this may seem far removed from the immediate problem of bulking, such pure culture information seems imperative for a complete understanding of the bulking phenomenon. Following this a series of experiments was performed in which bulking was induced in activated sludge by certain feeding procedures along with *Sphaerotilus* inoculations.

In previous papers of this series (*6*, *7*, *8*), the similarity of the sewage purification phenomenon by pure culture zoogleal bacteria and by normal activated sludge has been demonstrated. The sewage and glucose metabolism of both pure culture zoogleal sludges and of plant activated sludges has also been studied and reported (*9*, *10*). It was decided to study *Sphaerotilus natans* sludges in a similar manner to determine any differences in the metabolism of this organism, and to elucidate, if possible, the factors involved in sludge bulking and the accompanying overgrowth of the zoogleal bacteria by *Sphaerotilus*.

PRELIMINARY EXPERIMENTS

A number of early experiments were carried out in cooperation with the biological laboratory upon the growth requirements of *Sphaerotilus natans*. These experiments showed that the fungus had difficulty using glucose in a medium containing only glucose and mineral salts. If nitrogenous materials such as peptone, urea, many amino acids, or sterile domestic or synthetic sewage were added, the rate of growth and glucose utilization was greatly accelerated. In one such experiment in a medium containing glucose and mineral salts, only 41 p. p. m. out of 1,000 p. p. m. of glucose originally present, or 4.1 percent, were used in 120 hours by a *Sphaerotilus* culture. With settled sewage, however, the fungus was able to act upon 800 to 900 p. p. m. of glucose within 24 to 48 hours after inoculation. These experiments also indicated that the glucose attack by *Sphaerotilus* was, curiously, more vigorous when freshly inoculated than when concentrations of 200 to 500 p. p. m. of 48 to 72 hour cultures were used. It was also noted in one experiment that lactic acid was produced. However, lactic acid was not always produced in the metabolism of *Sphaerotilus natans*, and whether its production is due to a change in the metabolism under certain conditions, or to a special strain which cannot be differentiated morphologically from the common strains, is unknown at present.

Lackey and Wattie (*2*) also isolated a number of other fungi having the general macroscopic appearance and characteristics of *Sphaerotilus*. Experiments with pure cultures of three such strains of fungi indicated that these organisms attack glucose in glucose-sewage media at rates similar to *Sphaerotilus natans*.

FIRST EXPERIMENTS UPON OXYGEN UTILIZATION

A number of experiments to determine oxygen utilization rates were made in 1938 and 1939. The methods employed in the previous work upon zoogleal and plant activated sludges were used. Three bottles containing equal concentrations of *Sphaerotilus natans* were prepared. Two of these were dosed with fresh nutrient material and the third containing the original supernatant was used as a control. The oxygen utilization was then followed in the control and one of the fed culture bottles, while the liquor in these bottles was aerated by mercury pumps at rates of about 1.2 cu. ft. per hour. The *Sphaerotilus natans* solids and glucose content were followed in the third bottle, this bottle being aerated with compressed air. It was found that while this system of study had been satisfactory for the metabolic study of activated sludge and zoogleal bacteria cultures, it was not satisfactory for *Sphaerotilus natans*. The growth and metabolic rates were different in the bottles aerated by compressed air and by the mercury pump, apparently because of differences in some important factor or factors in the two bottles. A condensed summary of the results obtained in six of these experiments is given in table 1. If the results in this table are studied, they will be found to be somewhat inconsistent. Nevertheless, a number of interesting observations may be made from them. First, there seems to be no correlation between the initial quantity of *Sphaerotilus natans* and the quantity of glucose attacked or the extent of *Sphaerotilus* growth during aeration. Second, considering the very high B. O. D. of the feed used in these experiments the quantity of oxygen utilized by the fed culture seems to be low while the quantity used by the control seems rather high. Consequently, the increment of oxygen which was used as a result of the addition of the food appears low. This increment seems to bear no consistent relation to the quantity of glucose acted upon.

TABLE 1.—*Glucose removal and oxygen utilization by Sphaerotilus natans cultures*

(Results obtained by simultaneous aeration in 3 bottles)

Experiment No.	Initial values			After 23 hours of aeration of fed culture		Oxygen utilized in 23 hours of aeration		
	pH	*Sphaerotilus natans* solids	Glucose	*Sphaerotilus* solids	Glucose removed	By fed culture	By control culture	As result of food added
		P. p. m.	P. p. m.	P. p. m.	P. p. m.	P. p. m.	P. p. m.	P. p. m.
6	6.6	90	593	+148	91	77	19	58
7	6.4	418	1,097	+120	527	401	152	249
8	6.0	1,304	1,040	+468	831	----------	241	----------
9	6.8	1,532	1,083	+334	404	390	283	107
10	6.6	1,275	1,053	−229	853	325	256	69
13	6.8	153	1,311	+215	173	207	----------	----------

It is interesting to compare the quantities of oxygen used by 1-gram quantities of control zoogleal sludge, activated sludge, and *Sphaerotilus natans* sludge as shown below:

Observed oxygen utilization range in mg. O_2 per gram of control sludge in 24 hours

Pure culture zoogleal sludge	Plant activated sludge	Pure culture *Sphaerotilus natans* sludge
16.4 to 29.2	37.8 to 177.0	185 to 364

The differences in the 24-hour oxygen requirements of these three kinds of control sludges is very striking. The very high values for *Sphaerotilus natans* can undoubtedly be explained by two facts. The first is the much higher B. O. D. of the supernatant remaining in such cultures when developed rapidly in sterile sewage glucose media, and the second is the inability to remove as large a fraction of the supernatant aseptically in such cultures owing to the bulkiness and lack of ability of *Sphaerotilus natans* to settle and compact well in the allowable settling period. These experiments indicated that this method of study of *Sphaerotilus natans* metabolism was not satisfactory because of interfering factors which required investigation.

FACTORS AFFECTING THE GROWTH AND METABOLIC ACTIVITIES OF *SPHAEROTILUS NATANS*

Activated sludge plant operation efficiency is affected by such factors as the rate of aeration, pH, temperature and the dissolved oxygen content of the mixed liquor. At present the conditions obtaining in an activated sludge that favor the rapid accumulation of *Sphaerotilus* and the development of a bulky sludge are not well understood. Information as to the conditions which favor the optimum operation of the metabolic processes of *Sphaerotilus natans* and

consequently those which favor the rapid development of *Sphaerotilus* would be of value in determining the conditions under which bulking is not likely to occur. The previous experiments gave evidence that the above factors also affect the development of *Sphaerotilus natans*. Consequently, their effect upon the growth and metabolic processes of pure cultures of *Sphaerotilus natans* was studied in a series of experiments.

EXPERIMENTAL PROCEDURE IN A STUDY OF GROWTH FACTORS

The medium which had been found to contain ample quantities of all the nutrient materials for *Sphaerotilus natans* was used in all of these experiments. This medium contained the following materials:

	Mg.
Dextrose	1,000
Peptone	600
Meat extract	200
Urea	50
Na_2HPO_4	50
NaCl	15
$CaCl_2$	7
$MgSO_4$	5
KCl	7

Distilled water to make 1 liter.

Sixteen liter batches of the above medium were prepared and siphoned into each of five 4-liter serum bottles, the pH was adjusted to the desired point, and the bottles of media were sterilized. At the start of each experiment each bottle of medium was inoculated from a thriving 24-hour room temperature culture of *Sphaerotilus* in similar media. The culture used for inoculation contained from 268 to 1,300 p. p. m. of *Sphaerotilus* when determined as dry suspended solids.

While all plantings were made from pure cultures with sterile pipettes and the precautions used on zoogleal cultures to maintain pure cultures throughout the 24-hour aeration period were used, bacterial infections sometimes occurred. Usually a 50-ml. portion of the culture was used to inoculate each 4-liter bottle at the beginning of the experiment. Several *Sphaerotilus* strains were used. All of them were very much alike so far as metabolism was concerned except one strain (S–7) which, unlike the others, produced large quantities of lactic acid from glucose.

EFFECT OF AERATION RATE UPON *SPHAEROTILUS NATANS* GROWTH AND METABOLISM

Because it had been noticed in earlier work that the aeration rate affected the growth of *Sphaerotilus natans*, this factor was studied first. Experiments to determine whether *Sphaerotilus natans* was capable of anaerobic growth were included. Three experiments were run at room temperature. Fifteen rates of aeration varying from 0.0 to 11.8 cu. ft.

of air per hour per 3 liters of culture were used. The aeration rates were measured at the start and after 3 to 4 hours and some variations over the 24-hour period were unavoidable. Of the rates used four were less than 0.2 cu. ft. per hour, three in the range of 0.2 to 0.5 cu. ft. per hour, three between 1.0 and 3.0 cu. ft. per hour, and three greater than 5.0 cu. ft. per hour.

At the start and after 24 hours of aeration, examinations were made for bacterial infection, pH, glucose, and *Sphaerotilus* suspended solids. In one experiment total nitrogen determinations were also made. The dissolved oxygen of the aeration mixture was run immediately at the end of each experiment.

The analytical results obtained are given in table 2. These results indicate that most strains of *Sphaerotilus* utilized glucose and peptone with only a small drop in pH (from 6.9–7.1 at the start to 6.4–6.6 after 24 hours). In experiment S–23 with strain S–7, which is the lactic acid-producing strain, the pH dropped from 7.2 to 4.6 and affected the results obtained. For the nonacid-producing strains, as rates of aeration increased from 0.0 to 0.28 cu. ft. per hour, the quantity of *Sphaerotilus* solids produced increased from 17 to 598 p. p. m., above which rate there was no further definite trend. With the *Sphaerotilus* "increase factor," that is, the ratio of *Sphaerotilus* solids at the end to the solids at the start, there was a general rise as the rate of aeration increased to about 3.0 cu. ft. per hour. Above that aeration rate there was no further rise in the "increase factor." The percentage of glucose removed (or attacked) also increased as the rate of aeration increased to about 1.36 cu. ft. per hour, and with greater rates there was a tendency for this percentage to fall slightly. The ratio of the quantity of glucose removed to the *Sphaerotilus* solids produced increased with the rate of aeration up to a rate of 0.48 cu. ft. per hour, the trend for higher rates being erratic. The maximum percentage of total nitrogen taken up was obtained with an aeration rate of 1.36 cu. ft. per hour. The dissolved oxygen in the aerating cultures after 24 hours increased gradually as the rate of aeration increased to 2–3 cu. ft. per hour, above which rate dissolved oxygen values of 6.83 to 7.60 were obtained.

TABLE 2.—*Effect of rate of aeration on the metabolism of Sphaerotilus natans*

Experiment No.	S-22	S-26	S-22	S-22	S-21	S-22	S-22	S-21	S-23	S-23	S-21	S-23	S-23	S-23	S-21
Rate of aeration, cubic feet per hour	No aeration [1]	Nitrogen [1] gas bubbled through pyrogallol	Nitrogen gas [2]	0.007	0.027	0.14	0.28	0.375	0.48	1.36	2.85	2.90	5.4	11.1	11.8
pH: Initial	6.9	7.0	6.9	6.9	------	6.9	6.9	------	7.2	7.2	------	7.2	7.2	7.2	------
pH: Final	6.8	------	7.0	6.6	6.4	6.8	6.7	6.4	4.6	4.6	6.7	4.6	4.6	4.4	6.8
P. p. m. of *Sphaerotilus* solids: Initial	23.0	1.8	23.0	23.0	4.4	23.0	23.0	4.4	10.0	10.0	4.4	10.0	10.0	10.0	4.4
Quantity produced in 24 hours	17.0	11.0	61.0	136.0	140.0	385.0	598.0	329.0	147.0	260.0	547.0	511.0	272.0	183.0	452.0
Sphaerotilus increase factor	0.75	5.7	2.6	5.9	32.8	16.7	26.0	75.6	14.7	26.0	125.0	51.1	27.2	18.3	103.0
Glucose attacked in 24 hours in p. p. m., initial concentration 1,000-1,100 p. p. m.	0	0	32.0	51.0	203.0	289.0	703.0	682.0	561.0	705.0	[3] 917.0	691.0	589.0	547.0	513.0
Percentage nitrogen taken up in 24 hours	------	------	------	------	------	------	20.6	------	25.5	28.3	------	27.3	24.2	25.3	------
Mg. glucose attacked per mg. *Sphaerotilus* solids produced	0	0	0.52	0.37	1.46	0.75	1.17	2.07	3.81	2.71	1.68	1.35	2.16	2.96	1.20
Mg. glucose removed per mg. nitrogen taken up	------	------	------	------	------	------	24.8	------	13.4	15.2	------	15.5	14.8	13.2	------
Dissolved oxygen in substrate after 24 hours, p. p. m.	0.1	0.0	0.05	0.09	0.0	2.91	1.29	2.10	7.40	7.15	3.30	7.00	6.83	6.98	7.60

[1] Deaerated media in completely filled, stoppered bottles and agitated by end over end rotation at 1 r. p. m.
[2] The nitrogen gas contained 0.89 percent by volume of oxygen.
[3] Culture somewhat contaminated with bacteria.

The conclusion is that *Sphaerotilus natans* grows and carries on metabolic processes most efficiently at aeration rates of 0.5 to 3.0 cu. ft. per hour, as evidenced by the highest percentage of glucose removed, the greatest *Sphaerotilus* increase factors, the maximum total nitrogen uptake, and the maximum total nitrogen removed to glucose removed ratio. If the aeration rate of 2.85 cu. ft. per hour of experiment S–21 in which there was considerable bacterial contamination with the probable resultant utilization of oxygen is omitted from consideration, it appears that *Sphaerotilus natans* grew best at aeration rates providing at least 6.0 p. p. m. of dissolved oxygen at the end of the aeration period.

Sphaerotilus can grow and develop appreciably in substrates containing very low quantities, 0.1 to 2.0 p. p. m., of dissolved oxygen. It is significant that in a good medium *Sphaerotilus* can produce up to 598 p. p. m. of solids and utilize up to 600 to 700 p. p. m. of glucose at the low rates of aeration that are required to maintain these low dissolved oxygen values.

SPHAEROTILUS GROWTH IN THE ABSENCE OF OXYGEN AND WHEN NITROGEN IS USED FOR AGITATION

When nitrogen gas from a commercial tank was passed through inoculated media for 24 hours, increases in *Sphaerotilus* were also observed. In two experiments, 61 and 99 p. p. m. of *Sphaerotilus* solids were produced and 32 and 144 p. p. m. of glucose were taken up. The data obtained are also given in table 2. Analysis of the nitrogen gas showed oxygen as an impurity to the extent of 1.04 percent by weight. In another experiment the nitrogen gas was bubbled through a 2-ft. column of alkaline pyrogallol before passing through the *Sphaerotilus* inoculated medium. In this case an 11-p. p. m. increase in *Sphaerotilus* solids was obtained, but no reduction in the glucose was noted in 24 hours. These experiments with nitrogen are interpreted as indicating again the ability of *Sphaerotilus* to grow at very low oxygen tensions.

To determine whether growth was possible in the absence of any oxygen, a liter bottle of media was aseptically deoxygenated with N_2 gas to a dissolved oxygen content of 0.37 p. p. m. and *Sphaerotilus natans* was inoculated into it. The deaerated inoculated medium was siphoned aseptically to fill completely two sterile 1-liter pyrex glass-stoppered bottles. The stoppers were inserted and the sterile tinfoil replaced over them. The bottles were then placed in a turning machine and rotated, end over end, at one revolution per minute, for 24 hours. One bottle was then removed and sampled for dissolved oxygen, glucose, pH, and bacterial determinations. The first bottle was refilled from the second and the rotation was continued for another 48 hours.

After a total of 72 hours the sample was not contaminated and contained only a few small clumps of *Sphaerotilus*. The dissolved oxygen was 0.0, the pH 7.0, and the glucose content 1,056 p. p. m., indicating no change in this constituent. Glucose removal did not occur during either of the periods. The *Sphaerotilus* solids increased from 23 to 40 p. p. m. during the first 24 hours, indicating a very slight growth, but no further growth occurred in the remaining 48 hours. These results indicate that *Sphaerotilus natans* is capable of growing to a slight extent in a good medium at extremely low oxygen tensions but is unable to grow in the absence of oxygen.

EFFECT OF pH UPON *SPHAEROTILUS* GROWTH

In these experiments small quantities of 10 percent H_3PO_4, or 10 percent NaOH, were added to bring the pH to the desired point. The 4-liter bottles containing the media were sterilized, and before inoculation the pH was again checked and adjusted if necessary. All bottles were aerated for 24 hours at a rate as near 1.0 cu. ft. per hour as it was possible to maintain. Three experiments were run, one with a pH range from 3.0 to 7.0, and two with a range from 7.0 to approximately 10.0.

The analytical results obtained are given in table 3. These data indicate that aeration at a pH below 5 was detrimental to *Sphaerotilus* growth and metabolism. Glucose and nitrogen uptake was apparently completely stopped. Only 35 to 42 p. p. m. of *Sphaerotilus* were produced in 24 hours at these pH values. The high dissolved oxygen (7.75 to 7.90 p. p. m.) at the end of the experiment indicates that little oxygen was used.

Even at a pH of 6.0 the activity of *Sphaerotilus* was partially stopped. This is shown by the solids produced, glucose removed, and nitrogen uptake data. At this pH, 253 p. p. m. of *Sphaerotilus* were produced, 495 p. p. m. of glucose were removed, and 22 p. p. m. total nitrogen taken up.

The most favorable pH is the range from 6.6 to 9.0, as evidenced by a *Sphaerotilus* solids production of 480 to 635 p. p. m., a glucose utilization of 826 to 1,040 p. p. m. (71.3 to 90.3 percent), a total nitrogen uptake of 27.9 to 34.2 p. p. m., and by the highest ratios of glucose used to nitrogen used and solids produced to nitrogen used.

TABLE 3.—*Effect of pH of medium on the metabolism of Sphaerotilus natans*

Rate of aeration, cubic feet per hour	1.03	0.99	1.10	1.18	1.0	1.0	1.0	1.0	
								First 24 hours	Next 24 hours
pH Initial	3.90	4.95	6.05	7.05	8.0	9.0	+9.6	+9.6	8.4
pH After 24 hours	3.85	5.85	5.85	6.45	7.0	7.4	7.4	8.4	6.9
Sphaerotilus suspended solids:									
Initial	16.0	16.0	16.0	32.0	2.2	2.2	2.2	13.0	--------
Amount produced in 24 hours	37.0	35.0	253.0	480.0	497.0	585.0	510.0	39.0	--------
Glucose attacked, p. p. m., initial concentration between 1,100–1,200 p. p. m.	3.0	36.0	495.0	826.0	992 0	993.0	996.0	14.0	578.0
Percentage nitrogen taken up	0	2.8	15.7	24.2	25.3	22.7	24.5	0	--------
Mg. glucose attacked per mg. *Sphaerotilus* produced	.081	1.02	1.96	1.72	2.0	1.69	1.75	.36	--------
Mg. glucose used per mg. nitrogen taken up	--------	9.0	22.5	34.1	29.0	32.3	30.1	--------	--------
Mg. *Sphaerotilus* solids produced per mg. nitrogen taken up	--------	8.75	11.5	14.1	14.5	19.0	15.4	--------	--------
Dissolved oxygen content after 24 hours	7.90	7.75	4.60	.74	3.50	3.21	2.27	--------	--------

In one experiment, good growth occurred in a medium with an initial pH of about 9.6–10.0 and it was observed that the pH had dropped to 7.4 after 24 hours. In another experiment (last two columns in table 3) with the same initial pH there was only slight growth in the first 24 hours during which the pH had fallen to only 8.4. In the next 24 hours, however, considerable growth occurred, 578 p. p. m. of glucose were utilized, and the pH fell to 6.9. This seems to indicate that pH values between 8.5 and 10.0 have an inhibitory effect, but that the organisms are able to produce acid in sufficient quantities to bring the pH to a more favorable range for further growth.

EFFECT OF AERATION TEMPERATURE UPON GROWTH OF *SPHAEROTILUS*

The bottles of medium were prepared as before and each bottle was stored overnight at the temperature at which it was to be aerated. The tests at 10°, 15°, 20°, and 37° C. were carried out in incubators at these temperatures. The bottle which was to be aerated at 30° C. was aerated in an alberene stone hood which was maintained at 30° C. by radiation from a muffle furnace. The temperature in the hood varied slightly but remained between 29° and 31° C. most of the time. The aeration rates in this study were approximately 1.0 to 1.2 cu. ft. per hour. The experiments were carried out in the same manner as when aeration rates and pH were being studied.

TABLE 4.—*Effect of incubation temperature on the metabolism of Sphaerotilus*

Incubation temperature °C		10	15	20	30	37
Rate of aeration, cu. ft. per hour		1.24	1.0	1.0	1.23	1.0
pH	Initial	7.0	7.0	7.0	7.0	7.0
	Final (24 hours)	7.0	6.7	6.0	6.8	5.4
Sphaerotilus suspended solids, p. p. m.	Initial	8.5	1.8	1.8	8.5	1.8
	Amount produced in 24 hours.	8.0	133.0	989.0	708.0	390.0
Glucose removed, p. p. m. in 24 hours		17.0	44.0	633.0	1,003.0	533.0
Total nitrogen removed, p. p. m. in 24 hours		0	6.7	20.9	42.9	19.1
Mg. glucose used per mg. solids produced		2.12	0.33	0.64	1.41	1.42
Mg. glucose used per mg. nitrogen used			6.56	30.3	23.4	28.9
Dissolved oxygen after 24 hours			5.96	2.68		3.92

The results of the temperature experiments are given in table 4. At 10° C. only very slight growth occurs, as shown by the fact that only 8 p. p. m. of *Sphaerotilus natans* were produced and only 17 p. p. m., or 1.5 percent, of glucose were removed in 24 hours. At 15° C. the ability to grow is somewhat better but even at this temperature only 133 p. p. m. of *Sphaerotilus* solids were produced and 44 p. p. m. of glucose were removed. In the two tests at 20° C., 533 and 633 p. p. m. of glucose were removed and 370 and 989 p. p. m. of *Sphaerotilus* were produced. A drop to pH 5.4 in the first test probably accounts for the low *Sphaerotilus* yield. The yield of 989 p. p. m. of solids in the second test is higher than the average yield of about 490 p. p. m. for the 14 tests that were run at optimum aeration rates and pH values at 20° C. and at room temperature.

A temperature of 30° C. was most favorable for the growth of *Sphaerotilus natans*. At this temperature about 1,000 p. p. m., or over 86 percent, of the glucose was removed and about 700 p. p. m. of *Sphaerotilus* solids were produced. A fall in the glucose uptake to 437 and 553 p. p. m. and in solids production to 280 and 390 at 37° C. indicates that this temperature is above the optimum for this organism.

SPHAEROTILUS NATANS METABOLISM

In another series of experiments very small quantities of *Sphaerotilus natans* were inoculated into the sterile peptone glucose medium and two bottles were aerated simultaneously at 20° C., one by compressed air and the other by the mercury pump. In the last two of these experiments a small piston pump which was specifically designed for aeration of small quantities of liquids was used in place of compressed air. In the bottle aerated by the mercury pump, pH, glucose content, *Sphaerotilus natans* content, and B. O. D. of the supernatant were determined at the beginning and the end of the experiment, and the quantity of oxygen used was determined at regular intervals. In the bottle in which compressed air or the small piston pump was used for aeration the same determinations were made at intervals but

in place of oxygen used the carbon dioxide produced was determined. A summary of the analytical data obtained is given in table 5.

TABLE 5.—*Summary of analytical data on growth and metabolism of Sphaerotilus natans*

Seven experiments, 24-58 hour aeration periods	*Sphaerotilus* solids produced, p. p. m.	Glucose removed, p. p. m.	Oxygen used, p. p. m.	Carbon dioxide produced, p. p. m.	L value removed, p. p. m.
	Compressed air aeration				
Maximum values	799	931	[1] 616	848	[3] 1936
Minimum values	152	197	77	106	136
Mean values	387	464	220	303	795
	Mercury pump aeration				
Maximum values	544	986	550	[2] 756	[4] 959
Minimum values	206	292	105	144	146
Mean values	332	522	241	332	569

[1] Oxygen equivalent of CO_2 used.
[2] CO_2 equivalent of oxygen used.
[3] Data of five experiments only.
[4] Data of three experiments only.

In experiment 15 the aeration periods were different and checks in the analytical data cannot be expected. The mercury pump aerated cultures usually produced the least *Sphaerotilus natans*. In all of these experiments an average of 322 p. p. m. of *Sphaerotilus* were produced by them, compared to 387 p. p. m. for the compressed air unit. The mercury pump aerated cultures, however, removed an average of 522 p. p. m. of glucose compared to 464 for the compressed air aeration. By calculating oxygen equivalents of the CO_2 produced in the compressed air system the oxygen utilization in the two systems may be compared. Large differences in the quantities of oxygen utilized and CO_2 produced in experiments with the same aeration periods were obtained only in experiments 17 and 20.

The metabolic changes produced per unit of *Sphaerotilus* formed are given in table 6. While the quantity of glucose removed per mg. of *Sphaerotilus* produced varied considerably in the individual experiments, each result obtained is within the range of these values given in tables 2, 3, and 4. In the present experiments from 0.535 to 3.546 mg. of glucose were required per mg. of *Sphaerotilus* produced, while in table 2 this ratio varied from 0.37 to 3.81. The mean quantity of glucose used per mg. of *Sphaerotilus* formed for the mercury pump was 1.752 mg. compared with the mean of 1.242 for the compressed air experiments. Slightly higher L values removed per unit of *Sphaerotilus* formed (1.969 and 1.636 for the mercury pump and compressed air systems, respectively) were obtained, as would be expected.

In these experiments, with periods of aeration of 24 hours and longer, an average of about 0.67 mg. of CO_2 was produced for each

mg. of glucose removed. The quantity of CO_2 produced per mg. of *Sphaerotilus* produced varied from 0.296 to 2.183 mg. with a mean of about 1.0 mg.

TABLE 6.—*Summary of transformations produced by Sphaerotilus natans cultures*

Seven experiments—24–58-hour aeration periods	Mg. glucose used per mg. *Sphaerotilus* solids produced	Mg. CO_2 produced per mg. glucose used	Mg. CO_2 produced per mg. solids produced	Mg. B.O.D. (L value) removed per mg. solids produced	Mg. solids produced plus glucose equivalent of CO_2 produced per mg. glucose used
	Compressed air aeration				
Maximum values	1.98	[1] 1.06	[1] 1.81	[3] 2.42	[1] 2.04
Minimum values	.585	.373	.296	.575	.811
Mean values	1.24	.681	.930	1.64	1.34
	Mercury pump aeration				
Maximum values	3.55	[4] 1.264	[4] 2.18	[2] 2.77	[4] 2.24
Minimum values	.535	.917	.296	.709	.416
Mean values	1.75	.068	1.072	1.97	1.25

[1] Data of six experiments only.
[2] Data of three experiments only.
[3] Data of five experiments only.
[4] On basis of CO_2 equivalent of oxygen used.

It was learned also from experiments 14, 15, and 16 that more glucose was used per unit of *Sphaerotilus* produced as the aeration

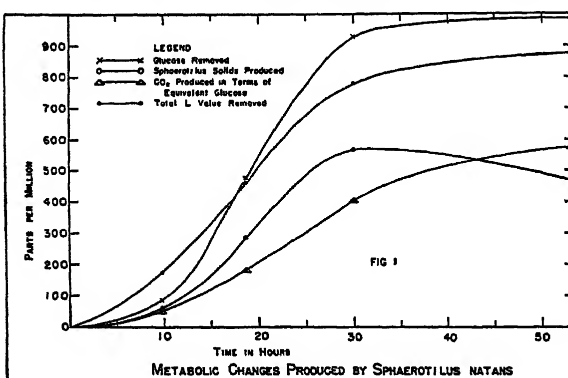


FIGURE 1

period was increased. With *Sphaerotilus natans* the metabolic activity apparently changes somewhat with the age of the culture, resulting in less synthesis and more respiration. No similar evidence of such a change in metabolism could be detected in our earlier studies with zoogleal sludge or plant activated sludge. The growth of *Sphaerotilus natans* and the chemical changes produced in the medium have been plotted in figure 1 for experiment 16 which is considered typical.

NUTRITIONAL EXPERIMENTS WITH PLANT ACTIVATED SLUDGE TO INDUCE BULKING

A series of experiments was carried out with plant activated sludge to study the joint effect of *Sphaerotilus natans* and variations in nutrition in inducing bulking. As these experiments progressed, changes in the procedures were made twice so that the experiments are divided into three parts.

EXPERIMENTAL PROCEDURE

Plant sludge was distributed in 8-liter quantities into six 10-liter serum bottles labeled A to F. Bottles A, B, C, and D received quantities of pure culture *Sphaerotilus natans* and cotton-filtered domestic sewage every day. In addition, B, C, and D received 200, 500, and 1,000 p. p. m. of glucose daily, whereas bottle A received no glucose. Bottle E received *Sphaerotilus natans* and 500 p. p. m. of glucose in distilled water but no nitrogenous or mineral material. Bottle F received filtered sewage plus 500 p. p. m. of glucose but no *Sphaerotilus natans*. The above feeding procedure may be outlined as follows:

Bottle containing plant sludge labeled	Filtered sewage	Glucose dose, p.p.m.	*Sphaerotilus natans*
A	+	0	+
B	+	200	+
C	+	500	+
D	+	1,000	+
E	−	500	+
F	+	500	−

The analytical work included settling tests, pH, suspended solids, and ash determinations. Twice each day, in the morning before feeding and in the afternoon 4 to 5 hours after feeding, sludge volumes at 10-minute intervals for a period of 1 hour were determined. Sludge temperature and pH were recorded at the time the settling tests were made. Suspended solids and ash were determined every morning before feeding, and the sludge index, according to Mohlman (*11*) was calculated. A *sludge looseness index* was also calculated. This we define as the sludge volume of a liter sample after a 10-minute settling period divided by the volume of the supernatant after a 60-minute settling period, or as $\frac{10' \text{ sludge volume}}{1{,}000\text{–}60' \text{ sludge volume}}$.

Each morning before feeding the air was turned off and each sludge allowed to settle for 1 hour after the 1-liter samples for the settleable solids test had been removed. As much as possible of the supernatant was siphoned off and the feeding procedure and *Sphaerotilus* inoculation carried out.

Each day a 24- to 48-hour room temperature culture of *Sphaerotilus* in a glucose peptone medium was used for inoculating the sludge. The 8-liter culture was settled and the concentrated solids were apportioned equally into each of the five bottles being inoculated.

After inoculation and feeding each bottle was aerated, at room temperature, at a rate of 3½ to 4 cu. ft. per hour per 6 liters of sludge (the minimum rate that would keep these sludges entirely in suspension). The glucose content of all sludge mixtures was determined 3 hours after feeding and again in the morning just before the settling, inoculation, and feeding procedures were repeated.

The total quantities of *Sphaerotilus natans* solids added to each bottle, by respective dates, were:

Total Sphaerotilus added, by respective dates

(Grams, dry solids)

Bottle	June 29	June 30	July 1	July 2	July 3	July 4	July 5	July 6	July 7
A	0.594	1.209	3.381	3.687	4.309	4.655	5.192	5.472	5.788
B	.594	1.209	3.381	3.687	4.309	4.655	5.192	5.472	5.788
C	.594	1.209	3.381	2.097	2.719	3.065	3.602	3.882	
D	.594	1.209	2.777	2.011	2.357	2.894			
E	.594	1.209	3.381	2.097	2.719	3.065	3.602		
F	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

[1] None.

As indicated, the values for total *Sphaerotilus* (cumulative) added on the respective dates vary somewhat even though similar inoculations were given to all bottles on each day. Because C, D, and E bulked, some sludge had to be wasted and the proportion of *Sphaerotilus* lost in wasting sludge was calculated. The figures do not indicate the quantities of *Sphaerotilus natans* present on these dates. The actual quantities of *Sphaerotilus* in the sludge could not be determined. However, counts of the *Sphaerotilus* flocs found per ml. of these sludges were made which indicated definite trends. These trends may be summarized as follows: After inoculation the first day from 1,152 to 2,816 flocs per ml. were found in these sludges. In sludge A, which received *Sphaerotilus natans* but no sugar, the count dropped after every feeding. In samples B and C, which received 200 and 500 p. p. m. of sugar respectively, no evidence of growth of the *Sphaerotilus natans* was found. In sludges D and E there was evidence that the *Sphaerotilus* remained viable but at the end of the experiment the numbers of flocs were no greater than at the start. In sludge F, which received 500 p. p. m. of glucose with sewage but no *Sphaerotilus*, very small numbers of *Sphaerotilus* flocs were found (64 to 128), and there was no tendency for the *Sphaerotilus* count to increase. The *Sphaerotilus natans* observed in F was present in the original sludge taken from the plant.

The effect of glucose and *Sphaerotilus natans* in inducing bulking is shown in figure 2. The graph records the change in sludge indices over the 9-day period of this experiment. As indicated by the very low indices for sludge A, *Sphaerotilus* alone will not induce bulking.

Glucose (when fed jointly with sewage) without *Sphaerotilus* induced slight bulking after the second day as indicated by sludge F.

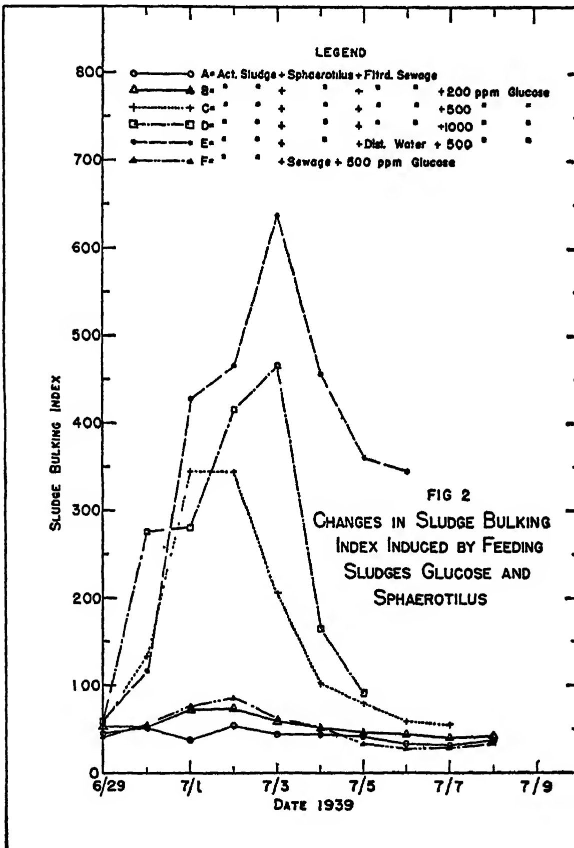


FIGURE 2

After 5 days of feeding with 500 p. p. m. of glucose in sewage, this sludge had completely recovered. *Sphaerotilus natans* and 200 p. p. m. of glucose also induced very slight bulking in B, but recovery occurred after the third day. However, *Sphaerotilus* and a glucose dose of 500 p. p. m. with sewage induced immediate bulking in C from which recovery, while slower, did occur after the seventh day. With a glucose dose of 1,000 p. p. m. (D) a maximum index of 465 was obtained after the fourth day which then rapidly dropped to less than

100 at the sixth day when the sludge was used for total purification and oxidation tests.

Glucose in distilled water plus *Sphaerotilus* was the most vigorous vector in inducing bulking. The sludge index of E fed in this manner increased from 50 to 270 the first day and reached a maximum of 640 in 5 days, after which it dropped gradually, but was still above 300 on the seventh day when this procedure was discontinued.

In figure 3 the looseness indices for this experiment have been plotted on a log scale with time. This shows the changes involved as effec-

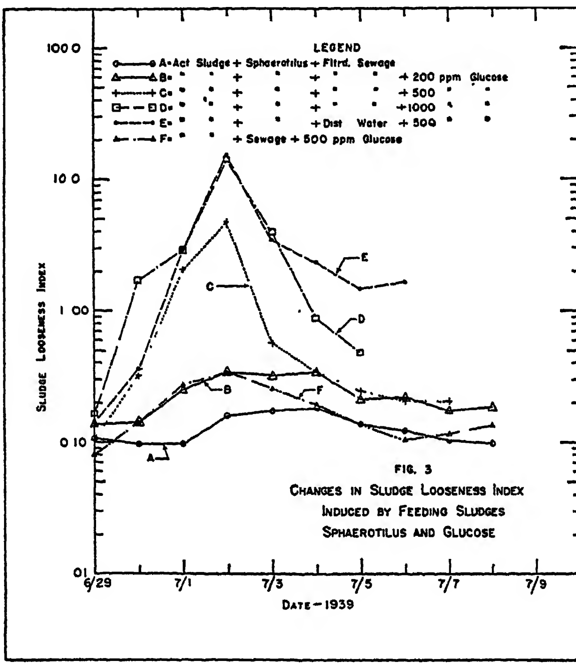


FIGURE 3

tively as the previous graph. This looseness index seems to be a more sensitive indicator of difference for cases of low sludge index.

The changes in the percentage of ash in the sludge have been plotted in figure 4. The low ash content is the result of feeding low ash *Sphaerotilus natans* and glucose.

Unfortunately our data are incomplete in respect to changes in glucose removal rates during the period when bulking was most rapid. However, in all sludges but E there was a gradual increase in the percentage removed in 3 hours. By the fifth day, A, B, C, and F (A received some glucose with the *Sphaerotilus* inoculum) were able to remove 90 to 100 percent of all glucose added in 3 hours. On the other hand, E, which received no organic nitrogen or minerals for metabolism. deteriorated in its glucose-removing ability, the per-

centage acted on in 3 hours falling from 30.4 percent after the first day to 4.3 percent on the sixth day. Sludge D, which received sufficient mineral and nitrogenous material with the glucose, removed 51.9 percent in 3 hours even when it was bulking severely.

After 9 days of treatment as described above, sludges A, B, and F were each divided between two 10-liter aeration bottles and each pair was treated as previously. One series of bottles designated A_1, B_1, and F_1, were aerated at the previous rate while the second series designated A_2, B_2, and F_2, were aerated at 10 to 11 cu. ft. per hour. All the previous tests were run and this experiment was continued for 4 days, at which time a total of 3.449 grams of *Sphaerotilus* solids had been added to each of the A and B series bottles. The F bottles received 500 p. p. m. of glucose with sewage daily but no *Sphaerotilus*.

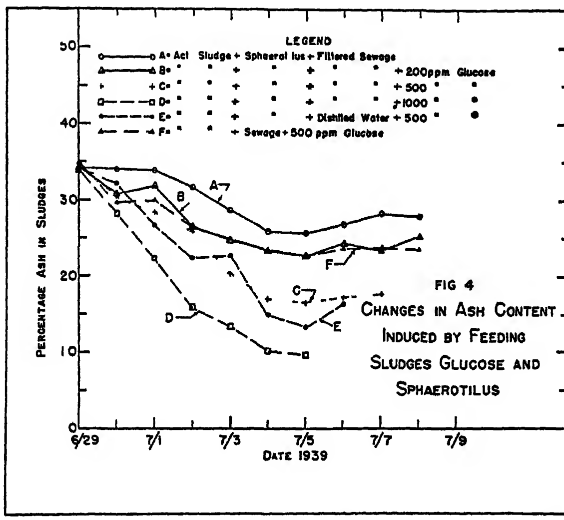


FIGURE 4

No additional bulking was noted in any of these sludges during this experiment. Increasing the rate of aeration to 10 cu. ft. per hour in the sub 2 series bottles showed no effect upon the sludge indices, but did increase somewhat the looseness index of these sludges.

THE EFFECT OF NUTRITIONAL TREATMENT AND BULKING UPON THE BIOCHEMICAL CHARACTERISTICS OF THE SLUDGE

After various periods of observation, the sludges receiving *Sphaerotilus* and varied nutritional treatment as described were taken for determination of their biochemical qualities. The over-all purification rate, the oxidation capacity, and sludge demand of each sludge were measured. All of these determinations were made as previously described (*8*). The total purification was determined with sewage

alone and also with sewage fortified with 500 p. p. m. of glucose. The oxidizing capacity was determined upon sewage alone. These tests were made upon sludge D after it had been under observation for 6 days, and similar tests were made upon the other sludges in the following order: E, C, F_2, B_2, and A_2. The data obtained on total or over-all purification are given in table 7, and the percentages of L value of domestic sewage removed are plotted in figure 5. The

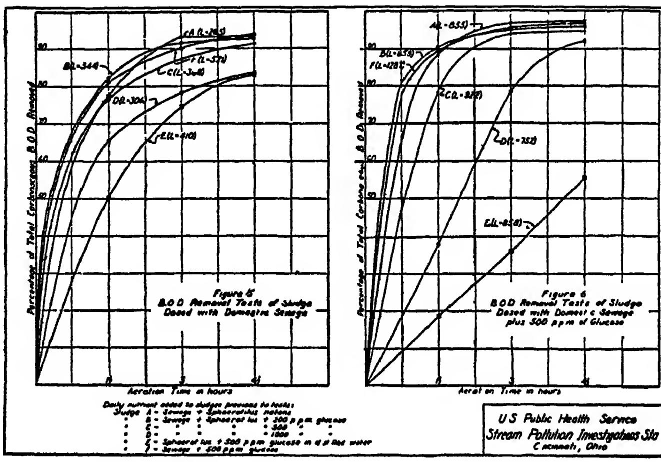


FIGURE 5 FIGURE 6

previous treatment and bulking had a decided effect in lowering the over-all purification for the first 1½ to 3 hours in the cases of sludges C, D, and E, the detrimental effect being greatest for sludges D and E. The L value removal of sewage plus glucose was still more deteriorated in these sludges for the first 1½ hours, as shown in figure 6. This deterioration is again greatest with E. The good sludges A_2, B_2, and F_2, on the other hand, were able to remove the B. O. D. of sewage plus glucose at a slightly greater rate than that of sewage alone.

TABLE 7.—*Differences in biochemical characteristics of sludges induced by Sphaerotilus and variations in feeding procedure*

Sludge	Days fed before testing	Sludge index	Suspended solids present, p. p. m.	Volume of sewage feed per liter of mixture, in ml.	Nature of test feed	Transformation of L value: Percentage removed (hours) 1½	3	4½	21	Percentage oxidized (hours) 1½	3	4½	Removal of glucose: Glucose present initially, p. p. m.	Percentage removed (hours) 1½	3	4½	21	Sludge demand, p. p. m. per gram sludge in indicated time (hours) 1½	3	4½
D	5	91.8	2,776	650	S[1]	65.7	78.3	83.8	90.1	11.6	19.0	24.2	----	----	----	----	----	13.4	23.7	30.5
					S+G[2]	37.8	78.3	91.9	94.3	----	----	----	680	33.8	----	91	100	----	----	----
E	6	347	1,800	750	S	50.5	74.6	83.1	89.2	4.17	11.2	18.3	----	----	----	----	----	15.8	22.0	28.6
					S+G	18.7	35.9	55.5	93.8	----	----	----	647	1.64	20.0	39.6	97.5	----	----	----
C	7	75.1	3,088	780	S	76.6	87.3	91.1	96.2	8.28	11.7	15.5	----	----	----	----	----	10.8	15.9	16.5
					S+G	78.2	93.8	94.5	93.7	----	----	----	----	----	----	----	----	----	----	----
F_2	10	24.8	2,620	800	S	81.2	90.3	94.0	98.5	8.57	10.6	16.4	----	----	----	----	----	3.47	6.98	11.0
					S+G	89.4	95.5	96.7	99.3	----	----	----	779	90.4	96.4	100	----	----	----	----
B_3	11	35.8	3,638	800	S	82.4	91.8	92.6	97.4	7.29	9.94	24.7	----	----	----	----	----	9.52	12.4	17.1
					S+G	90.3	95.0	95.8	98.7	----	----	----	535	80.6	92.5	100	----	----	----	----
A_2	12	36.4	2,608	800	S	77.6	93.3	93.4	97.3	17.8	25.8	33.5	----	----	----	----	----	8.63	15.8	19.3
					S+G	88.3	96.7	97.2	98.8	----	----	----	416	96.8	100	----	----	----	----	----

[1] Sewage alone.
[2] Sewage plus 500 p. p. m. glucose

The decrease in the over-all purification performance of sludges D and E is also correlated with a decrease in the ability to attack glucose. Sludges A_2, B_2, and F_2 were able to remove 80 to 96 percent of the glucose fed them in the sewage plus glucose feed in 1½ hours, and 96 to 100 percent in 3 hours. Sludge D was able to take up only 39 percent in 1½ hours while E removed only 1.6 percent in 1½ hours and 39.6 percent after 5 hours. As glucose is primarily removed through adsorption and synthesis rather than oxidation (*9*, *10*), this would indicate that the deterioration in over-all purification was not correlated with a reduction in the oxidation performance but rather with a deterioration in the adsorption and synthesis mechanism. The actual values for percentage of L value oxidized as given in table 7 seem to corroborate this. The data indicate no correlation between the approximately normal oxidation capacities of sludges D and E and their over-all B. O. D. purification deterioration.

There are no striking differences in the oxidation capacities of any of the sludges that received *Sphaerotilus natans* and glucose. However, sludge A_2, which received *Sphaerotilus natans* but no glucose, seems to be in a class by itself. Upon the basis of percentage of L value oxidized per gram, sludge A gave values of 6.8, 9.9, and 12.8 percent in 1½, 3, and 4½ hours, respectively. This performance is about double that of the mean for all sludges given regular doses of glucose.

There was a considerable variation in the sludge oxygen demand depending upon the previous treatment. The 4½-hour demand per gram of sludge varied from 11 to 19 mg. for the good sludges A_2, B_2, and F_2. Sludge F_2 which received 500 p. p. m. of glucose daily but no *Sphaerotilus natans* had the lowest demand. This would be expected from the pure culture experiments described earlier. Sludge D, which received *Sphaerotilus* and the largest glucose dose daily, had a (4½-hour) demand of 30.6 mg. per gram, the highest of these sludges. Sludge E, which received the same quantity of glucose as F but in distilled water and also received *Sphaerotilus*, had a demand under the same conditions of 28.6, or the second highest.

CONDITIONING OF SLUDGES TO *SPHAEROTILUS* AND GLUCOSE

Sludges A_2 and F_2 from the former experiment were each divided into two portions, A_3, A_4, and F_3, F_4. In addition two bottles of plant sludge, which was bulking somewhat (index 113) but contained little *Sphaerotilus*, were obtained and labeled P_3 and P_4. The sludges A_3, F_3, and P_3 were fed domestic sewage, and sludges A_4, F_4, and P_4 were fed sewage fortified with 1,000 p. p. m. of glucose. Pure culture *Sphaerotilus natans* solids, varying between 0.065 and 0.282 gram, were added to each of the six sludges daily. The experimental procedures employed were identical with those used in the previous series of sludges. This series was carried out for 10 days, at which

time the following amounts of *Sphaerotilus natans* were present in 8 liters of sludge aeration mixture, assuming no loss or gain:

A_3	3. 229
A_4	1. 816
B_3	3. 229
B_4	1. 816
P_3	1. 654
P_4	. 989

The sludge indices obtained during this experiment are plotted in figure 7, and the looseness indices are shown in figure 8. With the aeration procedure the same as before, apparently sludge A had become acclimated to *Sphaerotilus* doses and sludge F had become acclimated to glucose. In any case no disturbance in physical characteristics was produced in any of these sludges in this experiment.

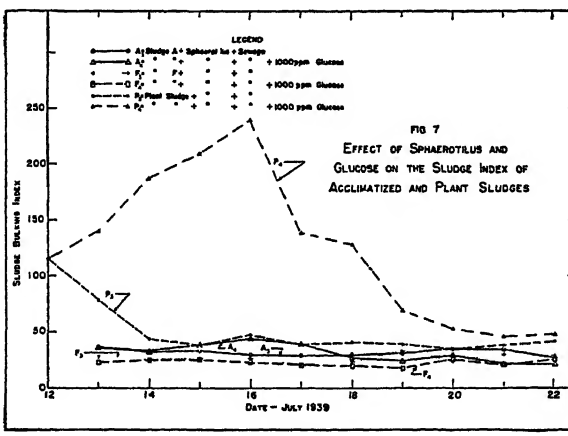


FIGURE 7

Sludges A_3, A_4, F_3, and F_4 all had indices under 50 throughout the experiment and the solids content varied from 2,300 p. p. m. at the start to 6,000 toward the end. In this experiment, therefore, bulking was not induced by *Sphaerotilus* and 1,000 p. p. m. of glucose in sludge A (which had received very little glucose previously), or in sludge F which had received no *Sphaerotilus* previously.

The plant sludge, however, behaved differently. The sludge as received had an index of about 113, indicating mild bulking. The addition of *Sphaerotilus* and sewage to P_3 did not further extend bulking but instead the sludge was able to recover and attained an index of 40 or less within 2 days. However, the addition of *Sphaerotilus* and glucose with sewage immediately intensified bulking, an index of 240 being reached after 4 days, which was followed by a gradual recovery.

Though no change was noted in the sludge index, differences in the looseness indices of A_3 and A_4, and F_3 and F_4 occurred in this experi-

ment. The looseness index of A_4 increased for 3 days and of F_4 for 6 days. Apparently the looseness index is more sensitive than the common index for slight disturbances in the physical structure of the sludge.

These experiments indicated that neither *Sphaerotilus natans* alone nor glucose alone will induce bulking in a well-aerated activated sludge. There may be a slight increase in the sludge index or the looseness index but recovery will be rapid even with continued feeding of glucose or *Sphaerotilus* with sewage. However, when both *Sphaerotilus* and glucose are added together to a sludge which has not previously received them, a disturbance of the sludge occurs and bulking is quickly produced, the extent depending upon the amount of glucose added.

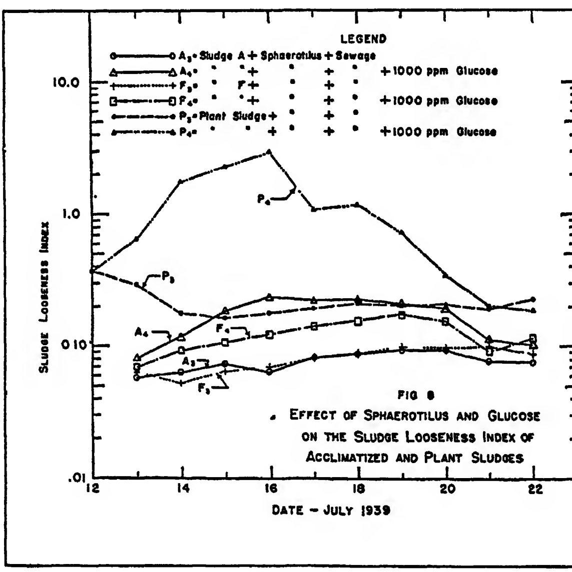


FIGURE 8

Gradually over a 5- to 10-day period recovery will take place even with continued application of the *Sphaerotilus* and glucose. It has been shown that addition of *Sphaerotilus* to a mildly bulking sludge, well aerated, did not intensify bulking, but was followed by recovery. Also, that a *Sphaerotilus* or glucose acclimated sludge well aerated was able to take regular applications of both *Sphaerotilus* and glucose without bulking sufficiently to be detected by changes in sludge index although a slight increase in the looseness index did occur.

DISCUSSION

It has been shown that *Sphaerotilus natans* grows well in an aerated glucose-peptone medium. Under such favorable conditions from 400 to 700 p. p. m. of fungus solids can be obtained in 24 hours from an

inoculum of only a few p. p. m. The medium containing the necessary mineral constituents along with 1,000 p. p. m. of glucose and 600 p. p. m. of peptone had an L value of about double that of a strong domestic sewage. This medium, though designed for the cultivation of *Sphaerotilus*, was also a very favorable substrate for the growth of zoogleal bacteria, inocula of 10 to 100 p. p. m. producing 440 to 570 p. p. m. of additional solids after 24 hours of aeration (*12*). Whereas there were decided variations in the response of different *Sphaerotilus* cultures to growth in this medium, the response of zoogleal cultures was more consistent. In any case, no evidence was obtained to indicate that the medium was more favorable to *Sphaerotilus* growth than to zoogleal growth.

However, several differences were noted in the metabolic activity and physiology of *Sphaerotilus* and *Zooglea ramigera*. Apparently some strains of *Sphaerotilus* are capable of producing organic end products of metabolism, appreciable amounts of lactic acid being produced even with rates of aeration providing oxygen for all metabolic needs. Most strains are not acid producers. However, in several instances a more rapid removal of glucose than of L value B. O. D. was observed which would indicate the break-up of at least a portion of the glucose into simpler products. Zoogleal bacteria, in pure culture or in activated sludge, on the other hand, have never been observed to produce any end products from glucose, when well aerated, other than CO_2 and cellular material.

On the basis of mg. of glucose acted on per mg. of solids produced in pure culture, there is very little difference in the performance of these organisms. These values ranged from 1.74 to 2.94 for zoogleal bacteria (*12*) and from 1.17 to 3.81 for *Sphaerotilus* under the same conditions. The variation is greater in this datum for *Sphaerotilus* than for the zoogleal organisms and this greater variation for *Sphaerotilus* was noted in all measurements that were made.

The values for mg. of solids produced per mg. of organic nitrogen taken up were quite different for the two organisms, being 22.5 to 34.1 for *Sphaerotilus natans* and only 5.40 to 6.99 for zoogleal bacteria. From this the *Sphaerotilus* might be expected to outgrow these bacteria in a medium containing a very limited amount of organic nitrogen. Another important difference is the much greater short time oxygen demand of *Sphaerotilus natans* control sludges compared to control activated sludges or pure culture zoogleal sludges. Finally, the metabolism of *Sphaerotilus* apparently changes somewhat with the age of the culture, but similar changes have not been observed with cultures of zoogleal bacteria.

The temperature experiments showed *Sphaerotilus* to have a somewhat narrower optimum growth range than zoogleal bacteria or

activated sludge. While the maximum rate of growth occurred at about 30° C., the rate fell off remarkably below 15° C. and was very limited at 10° C. This is undoubtedly the reason for less frequent difficulties with *Sphaerotilus* during the winter months. The optimum pH range for *Sphaerotilus* also was found to differ somewhat from normal activated sludge. *Sphaerotilus natans* grew very well over a pH range from 6 to about 9 and was able to remain viable and slowly reduce the pH at values up to about 10. However, it was very sensitive to pH values below 6.0 and growth was practically inhibited at values below 5.0. It appears much more sensitive to pH values below 6.0 than normal activated sludge.

The oxygen requirements of *Sphaerotilus* is a controversial question. If it were true, as some have claimed, that *Sphaerotilus* is a facultative anaerobe, it would be logical to assume that this organism might have a growth advantage over the strictly aerobic zoogleal organisms in activated sludges of zero or very low oxygen content. However, our results indicate very decidedly that *Sphaerotilus natans* can grow only under aerobic conditions and is dependent on oxygen as a hydrogen acceptor. In the total absence of oxygen no growth occurs and no glucose is acted upon. At low oxygen tensions growth of *Sphaerotilus* and removal of glucose does take place, but at a very low rate. With increasing rates of aeration the quantity of the organism produced increases rapidly, rates of 3 to 5 cu. ft. per hour per 3 liters of medium being optimum. In this respect the behavior of *Sphaerotilus* is identical with that of the zoogleal organisms. No evidence could be found that indicated that low rates of aeration were more favorable to the growth of *Sphaerotilus* than higher rates. There is some evidence, however, to indicate that aeration rates in the neighborhood of 10 cu. ft. per hour per 3 liters of medium did hinder *Sphaerotilus* growth somewhat. Such rates are sufficiently violent to break up the *Sphaerotilus* flocs and are much higher than any ever met in practice. It may be possible that at extremely low oxygen tensions *Sphaerotilus* may have some advantage over the zoogleal organisms, but evidence to indicate or disprove this has still to be obtained.

Zoogleal bacteria are quite sturdy organisms in that fairly large variations in environmental conditions such as oxygen tension, pH, temperature, and relative ratio of sludge to feed do not appreciably affect their metabolism and their floc properties. However, with extreme and sudden changes there can be expected unfavorable reactions on the part of these organisms toward the change in conditions. *Sphaerotilus*, on the other hand, is a much more delicate organism, small changes in conditions affecting its metabolism appreciably. This is evidenced by the variations in solids produced, glucose uptake, and other data obtained when *Sphaerotilus* was grown under conditions as nearly identical as possible. In other words, *Sphaero-*

tilus will appear in plants in practice only under the most favorable conditions for these organisms. That these are seldom obtained is evidenced by the generally infrequent and temporary appearance of the organism in large quantities.

Because carbohydrates in sewage are a superior food material for the organism, large quantities of *Sphaerotilus* have always been associated with the sudden appearance of abnormal quantities of carbohydrates in plant influents. Under such conditions bulking has frequently been observed. However, bulking cannot be considered as the direct effect of the *Sphaerotilus*, although the interweaving of the sludge flocs with the buoyant *Sphaerotilus* filaments can be a secondary factor in intensifying the bulking effect.

The sudden appearance of carbohydrates acts, in a manner not yet understood, as a shock to the organisms of the activated sludge system. The response to this shock is a biophysical change in floc properties resulting in a light, noncompact, poorly settling floc. It must be understood that bulking and the appearance of *Sphaerotilus* are both responses to the same change in conditions which upset the biological equilibrium, in this case the sudden appearance of carbohydrates. Our latter experiments support this conclusion.

The addition of sizable quantities of *Sphaerotilus* to good, active sludges will not induce bulking. As a matter of fact the *Sphaerotilus* will generally die out rapidly. Feeding glucose in addition to sewage may or may not induce bulking in a sludge free of *Sphaerotilus*. Further, sludges containing *Sphaerotilus* and being fed relatively small quantities of glucose with sewage will bulk slightly, but will immediately recover. Intense bulking will be obtained only when sludges containing *Sphaerotilus* are either fed sewage with very large quantities of glucose or are fed glucose in distilled water. In this latter case, the feeding of the glucose to the sludge without supplementary nitrogenous materials is such a strong "shocking" agent that the bulking condition produced is one from which recovery is very slow.

After sludges have been receiving such abnormal food for some time they become acclimatized and a new biological equilibrium is established for this condition. In our case following acclimatization to glucose the sludge was able to receive and react to 1,000 p. p. m. of glucose even in the presence of *Sphaerotilus* without bulking in any manner. That *Sphaerotilus* is not the direct causative agent of bulking is indicated by the fact that a bulking sludge normally receiving sewage can be fed *Sphaerotilus* and sewage without glucose and the bulking will gradually disappear.

The induction of bulking in sludges apparently does not affect the oxidizing capacity of the sludge. In other words, bulking is not associated with any change in the physiology of the zoogleal bacteria. However, bulking does seem to be connected with a decrease in the

adsorptive power of the sludge and must, therefore, be associated with some change in the physical state of the zoogleal matrix about the bacterial cells.

The sudden appearance of carbohydrates is not necessarily the only possible agency by which activated sludges can be "shocked" into a bulking condition. The majority of the cases of bulking in activated sludges are those not involving the presence of carbohydrates in the sewage. The activated sludge system involves the interaction of three factors—sludge, food, and oxygen. A sudden change in the quality of any one or more of these factors may serve to induce bulking in the sludge. Ingols and Heukelekian (*4*) have shown recently that bulking can be induced in sludges, with reduced aeration rates, by feeding them such materials as propionate, butyrate, glycerol, and even peptone. Hence, glucose is not the only material that may act to give rise to bulking of sludges. Any sudden appreciable change in the form of food material may be expected to "shock" a sludge into a bulking condition.

In a previous paper (*1*) these same investigators pointed out several situations productive of bulking in sludges being fed sewage only. They showed that, with a given sewage and a given sludge concentration, bulking may result from a sudden change in rate of air supply, particularly if the quantity of air has been appreciably decreased; also, that with a given sludge concentration and aeration rate, bulking can be induced by an abnormally strong sewage. They pointed out that frequent additions of a low B. O. D. sewage will not affect the sludge, but the same total amount of B. O. D. added in the form of a few additions of a very strong sewage will result in bulking. Higher temperatures, accelerating the rate of interaction of sludge, food, and oxygen will tend to accentuate the unbalanced condition; hence bulking is encountered more frequently under summer conditions than under winter conditions.

Activated sludges are very efficient agents for the biological purification of sewages and other wastes. After having been developed under given uniform conditions from a given type of influent, the sludges will have developed properties permitting them to handle that sewage most efficiently under those same conditions. If the conditions of plant operation are gradually changed, the sludge is capable of adapting itself to the new conditions. But, if the changes in conditions are sudden and large, the sludge undergoes a biophysical strain in meeting this new situation. When this "strain" is severe the properties of the floc are changed and bulking is the result. Consequently, to insure the most efficient operation of a plant, the operator must control as far as possible sudden changes in conditions which might upset or strain the sludge. The operator, unfortunately, is usually decidedly limited in preventing such changes by plant design.

In fact, most plants are not designed with sufficient flexibility to enable the plant operator to make proper adjustments when emergency conditions causing bulking arise. At some plants bulking almost always persists, indicating a continuous lack of equilibrium in the sludge, sewage, and air factors. This shows that a sludge cannot become adjusted to all situations. In such cases the factor causing the continuous "shock" must be found and corrected. No doubt there are constituents in some industrial wastes to which activated sludge would never become conditioned. Wastes containing the simple carbohydrates are not in this class. As shown, with proper food balance and sufficient aeration, activated sludge becomes conditioned to them and recovery from bulking takes place. In these cases a larger quantity of sludge with a lower ash content can be expected than would be obtained from domestic sewage.

We do not believe that there is any reason to differentiate bulking into two classes, carbohydrate *Sphaerotilus* bulking and sewage bulking. All bulking conditions that occur in activated sludge arise from a biophysical strain of the sludge due to sudden changes in operating conditions. Some of the vectors capable of producing such strains are now known to a certain extent. Undoubtedly, there are many more not yet discovered or appreciated. Most of the cases of bulking are probably caused by improper plant design and operating conditions. Others are due to the sudden appearance of abnormal materials or abnormal quantities of common materials in sewage. The former cases can be avoided; the latter can not. But even here, plant operators expecting the abnormal appearance of certain industrial wastes (for example canning wastes) should be on the lookout for them and make changes in operation procedures, if possible, to meet the expected conditions.

SUMMARY

Our strains of *Sphaerotilus natans* were found to be obligate aerobes, being similar to the zoogleal bacteria in this respect. They differed from the zooglea in their greater variability in viability and metabolism. Compared to zoogleal bacteria *Sphaerotilus natans* must be considered a delicate organism because of its sensitivity to variations in environmental factors. Its growth rate in pure culture in a glucose-peptone medium increases with aeration rate to rates considerably higher than those ordinarily used in practice. Its optimum pH range is from 6 to 9 and it is particularly sensitive to pH values below 5. The optimum temperature range is about 30° C. and growth practically ceases at 10° C. even at optimum conditions of other environmental factors.

402841°—41——3

Experiments to induce bulking indicated that bulking was a response of sludge organisms (zoogleal bacteria and probably others) to a sudden disturbance in biological equilibrium. The three primary factors involved include the sludge, food, and rate of oxygen supply. Variations in one or more of these factors may produce the disturbance causing bulking. This disturbance affects primarily the biophysical character of the matrix as indicated by a reduction in short time adsorption capacity and by the formation of a light noncompact floc. The disturbance does not immediately affect the oxidizing capacity of the floc. The phenomenon can therefore best be described as a biophysical response to a sudden change in biological equilibrium. The appearance of *Sphaerotilus natans* is not a primary cause of bulking. The disturbance to which the sludge floc responds to produce bulking in certain instances also produces *Sphaerotilus* growths. In such cases the interweaving of the *Sphaerotilus natans* filaments with the light floc accentuates the condition.

ACKNOWLEDGMENT

The authors wish to acknowledge the assistance of J. B. Lackey in obtaining *Sphaerotilus natans* cultures and for *Sphaerotilus* examinations, of C. T. Butterfield and Elsie Wattie for numerous bacterial examinations, and of Oliver R. Placak and Stephen Megregian for analytical work.

REFERENCES

(*1*) Heukelekian, H., and Ingols, R. S.: Studies on activated sludge bulking. II. Bulking induced by domestic sewage. Sewage Works J., **12:** 694 (1940).

(*2*) Lackey, James B., and Wattie, Elsie: Studies of sewage purification. XIII. The biology of *Sphaerotilus natans* Kutzing in relation to bulking of activated sludge. Sewage Works J., **12:** 669 (1940). Pub. Health Rep., **55:** 975 (1940). (Reprint No. 2166.)

(*3*) Littman, M. L.: Carbon and nitrogen transformations in the purification of sewage by the activated sludge process. IV. With a culture of *Sphaerotilus*. Sewage Works J., **12:** 685 (1940).

(*4*) Ingols, R. S., and Heukelekian, H.: Studies on activated sludge bulking. III. Bulking of sludge fed with pure substances and supplied with different amounts of oxygen. Sewage Works J., **12:** 849 (1940).

(*5*) Ingols, R. S.: Oxidation-reduction enzymes in activated sludge. Sewage Works J., **12:** 862 (1940).

(*6*) Butterfield, C. T., Ruchhoft, C. C., and McNamee, P. D.: Studies of sewage purification. VI. Biochemical oxidation by sludges developed by pure cultures of bacteria isolated from activated sludge. Sewage Works J., **9:**173 (1937). Pub. Health Rep., **52:** 387 (1937). (Reprint No. 1812.)

(*7*) Ruchhoft, C. C., McNamee, P. D., and Butterfield, C. T.: Studies of sewage purification. VII. Biochemical oxidation by activated sludge. Sewage Works J., **10:** 661 (1938). Pub. Health Rep., **53:** 1690 (1938). (Reprint No. 1987.)

(*8*) Ruchhoft, C. C., Butterfield, C. T., McNamee, P. D., and Wattie, Elsie: Studies of sewage purification. IX. Total purification, oxidation adsorption and synthesis of nutrient substrates by activated sludge. Sewage Works J., **11:**195 (1939). Pub. Health Rep., **54:** 468 (1939). (Reprint No. 2050.)

(*9*) Ruchhoft, C. C., Kachmar, J. F., and Moore, W. Allan: Studies of sewage purification. XI. The removal of glucose from substrates by activated sludge. Sewage Works J., 12: 27 (1940). Pub. Health Rep., 55:393 (1940). (Reprint No. 2142.)
(*10*) Ruchhoft, C. C., Kachmar, J. F., and Placak, O. R.: Studies of sewage purification. XII. Metabolism of glucose by activated sludge. Sewage Works J., 12: 485 (1940). Pub. Health Rep., 55: 582 (1940). (Reprint No. 2149.)
(*11*) Mohlman, F. W.: The sludge index. Sewage Works J., 6: 119 (1934).
(*12*) Unpublished data, 1940.

LEPROSY: COMPLEMENT FIXATION WITH GAEHTGENS' SPIROCHETE ANTIGEN COMPARED WITH STANDARD WASSERMANN AND KAHN TESTS

By D. W. PATRICK, *Passed Assistant Surgeon*, and D. M. WOLFE, *Assistant Bacteriologist, United States Public Health Service*

Capelli (*1*) in 1939 performed complement fixation tests on the serums of 24 leprous patients, employing Gaehtgens' phenolized cultures of *Treponema pallidum* (palligen) as antigen, and compared the results with those obtained with the Wassermann procedure and the Meinicke flocculation test with the same serums. He reported that with Gaehtgens' test none of the serums gave a positive (4 or 3 plus) result with the exception of that from one case which was considered to be syphilitic. The results were partially positive (1 or 2 plus) with 22 percent and negative with 78 percent of the serums. The Wassermann reactions were positive with 66 percent, partial with 17 percent, and negative with 17 percent of the serums. The Meinicke reactions were positive with 39 percent, partial with 22 percent, and negative with 39 percent of the serums. In performing the spirochete complement fixation test Capelli followed Gaehtgens' method which is essentially a "one-tube test" employing only one dose of the serum to be tested.

It was believed that the results obtained by Capelli were of sufficient significance to warrant a comparative study of the results obtained with the spirochete and Wassermann complement fixation and the Kahn flocculation reactions with serums of a larger number of leprous patients.

Each test was performed on a single specimen of serum obtained from 94 patients in Kalihi Hospital, Honolulu, who were considered nonsyphilitic after careful study, including detailed histories and complete physical examinations.

Badger et al. (*2*, *3*) noted that changes in serum reactions were correlated with changes in the clinical manifestations of the disease and that positive results were obtained more frequently with the serums of the nodular-infiltrated than with the maculo-anesthetic cases. In accordance with his results the cases employed in this study

have been divided into three groups—maculo-anesthetic bacteriologically negative, maculo-anesthetic bacteriologically positive, and nodular.

Gaehtgens' original procedure [1] was not followed exactly because it was considered more desirable to use the technique of the standard Wassermann (Kolmer) test, merely substituting the palligen for the Kolmer [2] antigen. In determining the proper antigenic dose of palligen it was found that Gaehtgens' recommended dose [1] (0.25 cc. of equal parts of stock palligen and 0.3 percent phenolized physiological salt solution) proved neither hemolytic nor anticomplementary and contained approximately 40 antigenic units when used in the Kolmer technique. This dose was used in our entire series of tests. Serum dilutions of 1:5, 1:10, and 1:20 were examined and the standard complement fixation procedure was closely followed. The final result of each serum specimen was obtained by totaling or summarizing the results of the three serum dilutions according to the usual method of quantitative reporting.

TABLE 1.—*Results of the spirochete complement fixation, Wassermann and Kahn tests on the serums of 94 nonsyphilitic leprous patients*

Type of case	Positive reaction ++++ and +++						Doubtful reaction ++ and +						Negative reaction					
	Spirochete complement fixation		Wassermann		Kahn		Spirochete complement fixation		Wassermann		Kahn		Spirochete complement fixation		Wassermann		Kahn	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Maculo-anesthetic, bacteriologically negative, 17 cases	[1] 1	5.9	0	0	0	0	0	0	0	0	0	0	16	94.1	17	100.0	17	100.0
Maculo-anesthetic, bacteriologically positive, 30 cases	[1] 1	3.3	3	10.0	5	16.6	2	6.7	0	0	0	0	27	90.0	27	90.0	25	83.4
Nodular, 47 cases	[2] 5	10.5	33	70.0	31	66.1	4	8.5	2	4.3	5	10.5	38	81.0	12	25.7	11	23.4
Total, 94 cases	7	7.4	36	38.3	36	38.3	6	6.4	2	2.2	5	5.3	81	86.2	56	59.5	53	56.4

[1] With these serums the results obtained with the Wassermann and Kahn tests were negative.
[2] The results obtained with each of these serums with the Wassermann and Kahn tests were also positive.

The results obtained are illustrated in the accompanying table. It is apparent that fewer positive results were obtained with the spirochete complement fixation test than with either the Wassermann or Kahn test [3]—7.4 percent with the former and 38.3 percent

[1] The antigen (lot No. 119) was secured from the Saxon Serum Works, Dresden, Germany, and is sold under the trade name "Palligen." The Gaehtgens procedure accompanied the antigen.
[2] The Kolmer and Kahn antigens and the antisheep hemolysin were commercial products.
[3] The results of our Wassermann and Kahn tests were frequently checked in two other laboratories, Queen's Hospital and Territorial Board of Health.

with each of the latter. It also will be noted that, as with the Wassermann and Kahn tests, more positive results were obtained with the serums of the nodular cases than with those of the maculo-anesthetic cases.

CONCLUSIONS

When examined with the spirochete complement fixation test, the serums of nonsyphilitic leprous patients exhibit a tendency toward falsely positive results, although to a lesser degree than with the Wassermann and Kahn tests.

With the spirochete complement fixation test as well as with the Wassermann and Kahn tests, more positive results are obtained with the serums of the nodular type than with serums of the maculo-anesthetic type.

REFERENCES

(1) Capelli, E.: Giornale di Batteriologia e Immunologia, 22: 425 (1939).
(2) Badger, L. F.: Public Health Reports, 46: 957 (1931).
(3) ————: National Institute of Health Bulletin No. 173, Government Printing Office, Washington, 1940.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

July 13–August 9, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended August 9, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period July 13–August 9, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period, 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	609	640	1,111	2,715	1,476	1,069	12,170	10,086	8,204
New England	17	16	21	3	3	3	1,279	1,927	899
Middle Atlantic	68	74	138	13	13	20	3,336	3,213	2,631
East North Central	99	110	205	73	93	93	2,607	2,618	2,328
West North Central	51	63	69	26	11	71	467	373	265
South Atlantic	123	124	219	707	526	324	2,269	400	535
East South Central	50	50	126	72	59	97	411	372	210
West South Central	105	91	148	1,370	636	261	605	362	231
Mountain	56	51	51	161	86	66	407	345	345
Pacific	40	61	82	290	49	55	771	476	763
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	116	106	151	1,296	716	716	2,714	2,985	3,508
New England	6	5	6	27	7	16	274	157	205
Middle Atlantic	81	17	31	130	19	34	588	796	740
East North Central	13	11	21	146	183	183	779	939	1,157
West North Central	8	13	13	40	127	69	289	256	396
South Atlantic	22	21	29	490	65	65	228	244	247
East South Central	20	20	24	389	42	42	169	147	149
West South Central	7	8	15	32	89	42	103	103	159
Mountain	5	4	6	12	41	22	80	100	150
Pacific	4	7	14	30	143	130	204	243	255
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	29	108	239	1,199	1,481	2,058	16,099	13,822	[3] 14,614
New England	0	0	0	23	33	39	1,123	945	929
Middle Atlantic	0	0	0	164	122	141	2,611	3,124	4,526
East North Central	10	20	66	136	113	220	4,155	3,553	4,423
West North Central	9	45	81	62	113	118	1,169	760	760
South Atlantic	2	1	1	264	284	493	2,351	1,691	1,891
East South Central	0	8	4	187	185	427	503	591	571
West South Central	3	6	6	264	513	541	1,037	1,163	1,016
Mountain	4	20	36	53	45	55	1,171	582	582
Pacific	1	8	31	46	73	70	1,989	1,413	1,168

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—Influenza still maintains a relatively high level. There were 2,715 cases reported for the 4 weeks ended August 9, which was about 1.8 times the number reported for the corresponding period in 1940 and more than 2.6 times the 1936–40 median figure for the period. The North Atlantic, North Central, and East South Central regions reported a comparatively low incidence, but in the South Atlantic, West South Central, Mountain, and Pacific regions the numbers of cases were relatively high. The lowest incidence of this disease is usually reached during this period of the year and while the disease has followed the usual trend, the number of cases occurring during the

current period is the highest recorded for this period in the 13 years for which these data are available.

Measles.—The incidence of measles was also the highest in recent years. While the number of cases dropped from approximately 45,000 during the preceding 4-week period to approximately 12,000 during the current 4-week period, the number of cases was almost 25 percent in excess of the 1940 incidence and almost 50 percent in excess of the 1936–40 average incidence for the corresponding period. Each section of the country contributed to the high incidence of this disease but the largest numbers of cases were reported from the regions along the Atlantic coast and the East North Central regions. In the South Atlantic region the number of cases was more than 4 times the normal seasonal incidence.

Poliomyelitis.—The number of cases of poliomyelitis rose from 415 cases for the preceding 4-week period to 1,296 for the 4 weeks ended August 9. The current figure was 1.8 times the incidence during the corresponding period in 1940 (716 cases), which figure also represents the average incidence for the period. The current outbreak of this disease started in June in the South Atlantic and East South Central regions and of the total number of cases for the current period 312 were reported from Georgia, 233 from Alabama, 80 from Tennessee, and 69 from Florida; more than one-half of all of the reported cases occurred in those 4 States. During the latter part of the current period, the States in the Middle Atlantic region reported rather sharp increases in the number of cases, with minor rises in the New England States. Other regions have shown no signs of anything other than the normal rise expected at this season of the year; and for the current period in these regions the disease is considerably less prevalent than it was in 1940 and is well below the seasonal expectancy. For the country as a whole the current incidence has been exceeded only twice since 1931—in 1937, when the cases for this period totaled 1,594, and in 1935, when a total of 1,433 cases was recorded for the period.

Whooping cough.—The number of cases of whooping cough was considerably above the average seasonal level, approximately 16,000 cases as compared with a 1938–40 median of approximately 14,600 cases. The Middle Atlantic, East North Central, and East South Central regions reported a relatively low incidence, but in all other regions the cases were considerably in excess of the average seasonal incidence.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended August 9 there were 609 cases of diphtheria reported, as compared with 640, 1,030, and 1,288 for the corresponding period in 1940, 1939, and 1938, respectively. In all regions except the Mountain the number of cases was lower than the

1936–40 median incidence for this period. The downward trend of this disease has been unbroken during this period in the 13 years for which these data are available; during the corresponding period in 1929, 3,520 cases were reported.

Meningococcus meningitis.—Due largely to an increase over last year in the number of cases of this disease in the Middle Atlantic region, the incidence (116 cases) for the country as a whole was about 10 percent in excess of the 1940 figure for this period. The number was, however, less than 80 percent of the (1936–40) average seasonal incidence, with the number of cases in the North Atlantic and Mountain regions standing at the expected seasonal level and all other regions reporting a relatively low incidence.

Scarlet fever.—The incidence of scarlet fever was also relatively low, the number of cases (2,714) being about 90 percent of last year's figure and less than 80 percent of the 1936–40 median incidence for this period. A few more cases than might normally be expected were reported from the New England and East South Central regions, but in all other regions the incidence was comparatively low.

Smallpox.—The reported cases (29) of smallpox dropped considerably below the number reported for the corresponding period last year, which number (108) was the lowest on record for this period. No cases were reported from the North Atlantic and East South Central regions, 10 occurred in the East North Central region, 9 in the West North Central region, and the remaining 10 cases were scattered over the remainder of the country.

Typhoid fever.—Typhoid fever was considerably less prevalent than it was in 1940 and the incidence reached a new low level for this period. The number of reported cases was 1,199, as compared with 1,481, 2,001, and 2,022 for the corresponding period in 1940, 1939, and 1938, respectively. In the Middle Atlantic region the number of cases was slightly above the seasonal average and in the Mountain region the incidence was about normal, but all other regions reported a relatively low incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended August 9, based on data received from the Bureau of the Census, was 10.6 per 1,000 inhabitants (annual basis). The average rate for this period in the 3 preceding years was 10.5 per 1,000.

DEATHS DURING WEEK ENDED AUGUST 16, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 16, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,294	6,920
Average for 3 prior years	7,237	
Total deaths, first 33 weeks of year	284,359	284,994
Deaths per 1,000 population, first 33 weeks of year, annual rate	12.1	12.1
Deaths under 1 year of age	477	458
Average for 3 prior years	486	
Deaths under 1 year of age, first 33 weeks of year	17,358	16,601
Data from industrial insurance companies:		
Policies in force	64,418,462	64,932,518
Number of death claims	10,925	12,001
Death claims per 1,000 policies in force, annual rate	8.8	9.7
Death claims per 1,000 policies, first 33 weeks of year, annual rate	9.8	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 23, 1941

Summary

A total of 611 cases of poliomyelitis was reported for the current week, as compared with 549 for last week—a smaller numerical increase than that recorded for either of the preceding two weeks. Most of the current increase occurred in the 3 Middle Atlantic States—New York, New Jersey, and Pennsylvania. The South Atlantic, East South Central, and MiddleAtlantic States reported the largest numbers of cases and the highest incidence rates for the current week, and have recorded the highest rates this year to date. These States reported 75 percent of the current total.

The following 11 States reported 15 or more cases (last week's figures in parentheses): Pennsylvania, 82 (45); Alabama, 78 (82); Georgia, 74 (69); New York, 66 (49); Ohio, 44 (37); Tennessee, 39 (37); New Jersey, 25 (17); Kentucky, 25 (15); Illinois, 23 (18); Maryland, 21 (16); and California, 16 (5). Twelve States reported 15 or more cases last week.

More cases of poliomyelitis have been reported in the United States this year to date (3,433) than for the corresponding period of any year since 1937, when 4,250 cases were reported.

North Dakota reported 120 cases of infectious encephalitis (340 last week), Minnesota 95 (121 last week), South Dakota 38 (44 last week), and Colorado 20 (epidemic or lethargic) (32 last week). The fatality rate in North Dakota has been about 10 percent.

The fatal human case of plague reported in California during the week ended August 16 occurred in Siskiyou County.[1]

Ninety-eight cases of endemic typhus fever were reported, as compared with 166 last week, when 123 cases were reported in Texas (104 in Lavaca County). For the current week, Georgia reported 44 cases, Texas 23, Louisiana 10, and Alabama 9.

Of 26 cases of Rocky Mountain spotted fever, only 4 occurred in the Rocky Mountain area.

The death rate for the current week for 88 large cities was 9.9 per 1,000 population, as compared with 10.2 last week and with a 3-year (1938–40) average of 9.8.

[1] See p. 1767.

Telegraphic morbidity reports from State health officers for the week ended August 23, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Aug. 23, 1941	Aug. 24, 1940		Aug. 23, 1941	Aug. 24, 1940		Aug. 23, 1941	Aug. 24, 1940		Aug. 23, 1941	Aug. 24, 1940	
NEW ENG.												
Maine	1	1	0	------	------	------	9	2	6	0	0	0
New Hampshire	0	0	0	------	------	------	0	0	0	0	0	0
Vermont	0	0	0	------	------	------	12	1	2	0	0	0
Massachusetts	4	1	2	------	------	------	73	70	36	0	2	1
Rhode Island	8	0	0	------	------	------	0	10	5	0	0	0
Connecticut	0	0	0	------	------	------	24	4	8	1	0	0
MID ATL.												
New York [1]	7	7	9	[2] 0	[2] 4	[2] 2	90	138	93	2	3	3
New Jersey	1	5	6	2	------	6	31	60	37	0	0	1
Pennsylvania [3]	8	2	15	------	------	------	92	107	39	0	1	2
E. NO. CEN.												
Ohio [3]	4	12	12	2	8	4	28	15	15	1	2	2
Indiana [3]	1	0	7	7	------	4	1	2	4	2	0	0
Illinois	9	8	15	2	------	4	24	35	35	3	2	2
Michigan [4]	0	5	6	------	6	1	27	83	24	1	1	0
Wisconsin	1	0	1	2	11	15	76	82	24	1	1	1
W. NO. CEN.												
Minnesota	3	0	1	2	5	1	3	2	2	0	0	0
Iowa [3]	0	5	2	------	3	------	5	7	7	0	2	1
Missouri [3]	5	9	6	------	1	7	7	3	2	0	2	1
North Dakota	0	8	2	18	------	------	18	0	0	0	1	0
South Dakota	7	0	0	------	------	------	2	0	0	0	0	0
Nebraska	1	0	1	------	------	------	0	1	3	0	1	0
Kansas	2	6	3	------	2	1	11	9	9	2	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	1	0	0	0	0	0
Maryland [3,4]	1	8	3	3	3	2	4	3	10	2	0	0
Dist. of Col	0	1	2	------	------	------	10	2	2	0	0	0
Virginia [3]	16	2	18	40	83	------	22	27	16	4	0	0
West Virginia [3,4]	6	1	6	24	13	13	45	1	2	0	1	1
North Carolina [3]	14	9	31	------	------	------	14	4	5	0	0	1
South Carolina [1]	22	8	9	56	129	112	55	16	5	0	0	0
Georgia [1]	11	10	22	8	1	------	37	0	------	0	0	0
Florida [1]	2	3	3	2	1	1	4	2	2	0	0	0
E. SO. CEN.												
Kentucky	3	7	9	------	------	3	6	15	4	0	0	0
Tennessee	10	2	11	11	6	9	15	23	11	0	1	1
Alabama [1]	11	10	15	7	1	4	4	26	17	1	2	1
Mississippi [1,4]	11	3	15	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	10	3	8	2	1	5	12	10	5	1	0	0
Louisiana [1,3]	5	10	10	------	2	7	1	2	2	0	3	1
Oklahoma	3	2	7	19	20	10	7	3	3	0	0	0
Texas [1,4]	14	11	23	207	61	37	163	24	16	1	1	1
MOUNTAIN												
Montana [3]	1	2	1	------	------	------	3	5	5	0	0	0
Idaho	0	0	0	------	------	------	0	0	1	0	0	0
Wyoming	0	0	0	------	------	------	3	3	1	0	0	0
Colorado [3]	10	7	7	19	2	------	14	5	3	0	0	1
New Mexico	1	2	2	------	1	------	4	1	5	0	0	0
Arizona	1	1	2	15	12	12	20	12	3	0	0	0
Utah [3,4]	0	1	1	9	------	------	6	9	6	0	0	0
Nevada	0	------	------	------	------	------	2	------	------	0	------	------
PACIFIC												
Washington	0	0	2	------	------	------	1	9	13	1	0	0
Oregon	5	1	1	6	4	4	8	15	7	0	2	0
California	3	8	17	16	4	11	74	31	49	1	0	0
Total	220	181	339	539	384	356	1,068	879	745	24	29	29
34 weeks	7,846	9,046	14,082	600,411	169,606	152,006	831,515	229,371	270,548	1,440	1,187	2,188

Telegraphic morbidity reports from State health officers for the week ended August 23, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Aug. 23, 1941	Aug. 24, 1940		Aug. 23, 1941	Aug. 24, 1940		Aug. 23, 1941	Aug. 24, 1940		Aug. 23 1941	Aug. 24, 1940	
NEW ENG.												
Maine	2	0	0	2	1	2	0	0	0	0	0	2
New Hampshire	0	0	0	2	0	0	0	0	0	0	1	1
Vermont	0	0	0	2	1	1	0	0	0	0	1	0
Massachusetts	8	4	4	36	21	21	0	0	0	1	1	3
Rhode Island	4	1	1	4	0	0	0	0	0	0	1	1
Connecticut	7	0	0	6	2	5	0	0	0	1	3	3
MID. ATL.												
New York [1]	66	14	14	35	57	57	0	0	0	18	18	18
New Jersey	25	4	4	15	18	17	0	0	0	7	8	8
Pennsylvania [3]	82	7	7	30	31	43	0	0	0	18	15	25
E. NO. CEN.												
Ohio [3]	44	46	8	28	48	48	0	0	0	7	18	17
Indiana [3]	7	79	1	8	17	20	0	1	1	2	1	7
Illinois	23	21	15	38	43	51	0	0	1	23	12	23
Michigan [4]	6	98	31	27	30	40	1	1	1	7	4	7
Wisconsin	2	12	8	28	38	38	0	2	1	0	0	2
W. NO. CEN.												
Minnesota	14	8	8	8	14	16	0	2	0	0	0	1
Iowa [3]	2	73	4	5	14	15	0	1	2	3	8	8
Missouri [3]	0	18	2	6	14	15	0	0	0	7	20	22
North Dakota	0	2	0	0	0	5	0	1	1	0	0	1
South Dakota	0	4	2	2	1	7	0	0	0	0	0	1
Nebraska	0	15	2	3	3	3	1	0	0	0	1	1
Kansas	1	42	1	16	20	19	0	0	0	0	5	6
SO. ATL.												
Delaware	2	0	0	1	2	0	0	0	0	1	1	1
Maryland [3,4]	21	1	1	31	3	7	0	0	0	11	6	13
Dist. of Col.	6	0	1	4	3	3	0	0	0	2	5	3
Virginia [3]	9	6	4	11	12	11	0	0	0	10	5	20
West Virginia [3,4]	1	46	0	13	20	20	0	0	0	11	6	10
North Carolina [3]	4	4	4	11	13	16	0	0	0	7	8	20
South Carolina [1]	8	0	1	5	5	5	0	2	0	6	24	14
Georgia [1]	74	0	2	14	6	10	0	0	0	28	19	26
Florida [1]	14	2	1	2	3	2	0	0	0	7	3	3
E. SO. CEN.												
Kentucky	25	18	4	23	13	16	1	0	0	16	15	31
Tennessee	39	1	2	13	10	14	0	0	0	15	21	21
Alabama [1]	78	0	1	11	14	14	0	0	0	5	13	17
Mississippi [1,4]	5	5	5	4	5	5	0	0	0	12	11	9
W. SO. CEN.												
Arkansas	1	1	1	2	4	9	0	0	0	13	26	26
Louisiana [1,3]	7	10	2	3	2	2	0	0	0	9	25	25
Oklahoma	1	14	1	5	7	7	0	1	0	5	25	24
Texas [1,4]	2	14	10	18	14	16	0	0	0	32	59	30
MOUNTAIN												
Montana [3]	0	15	1	9	2	6	0	0	2	1	0	1
Idaho	0	2	0	1	2	3	0	0	1	1	0	1
Wyoming	0	0	0	0	2	3	0	0	0	0	4	0
Colorado [3]	1	2	2	9	5	7	0	2	1	1	3	5
New Mexico	0	2	1	1	2	2	0	0	0	3	4	4
Arizona	0	1	1	1	1	1	0	0	0	0	0	5
Utah [3,4]	1	4	1	2	5	5	0	0	0	2	1	2
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	13	2	7	14	12	0	0	1	9	0	4
Oregon	3	1	1	11	5	5	0	0	1	4	2	3
California	16	13	13	45	41	57	0	0	1	3	9	9
Total	611	623	391	558	588	697	3	13	34	308	412	571
34 weeks	3,433	2,695	2,530	92,453	119,475	137,851	1,193	1,971	8,046	4,804	5,405	7,584

Telegraphic morbidity reports from State health officers for the week ended, August 23, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Aug. 23, 1941	Whooping cough, Week ended— Aug. 24, 1940
NEW ENG.		
Maine	13	16
New Hampshire	1	0
Vermont	14	0
Massachusetts	124	116
Rhode Island	15	7
Connecticut	44	38
MID. ATL.		
New York [1]	253	247
New Jersey	116	112
Pennsylvania [3]	193	400
E. NO. CEN.		
Ohio [3]	221	263
Indiana [3]	18	11
Illinois	213	156
Michigan [4]	182	215
Wisconsin	208	102
W. NO. CEN.		
Minnesota	53	40
Iowa [3]	29	22
Missouri [3]	4	42
North Dakota	18	21
South Dakota	18	3
Nebraska	4	3
Kansas	58	26
SO. ATL.		
Delaware	1	0
Maryland [3 4]	28	90
Dist. of Col	23	6
Virginia [3]	57	59
West Virginia [3 4]	29	62
North Carolina [3]	107	82
SO. ATL.—continued		
South Carolina [1]	53	25
Georgia [1]	20	11
Florida [1]	13	1
E. SO. CEN.		
Kentucky	51	66
Tennessee	44	30
Alabama [1]	12	55
Mississippi [1 4]		
W. SO. CEN.		
Arkansas	7	18
Louisiana [1 3]	12	57
Oklahoma	6	8
Texas [1 4]	92	188
MOUNTAIN		
Montana [3]	21	9
Idaho	17	8
Wyoming	15	0
Colorado [3]	108	13
New Mexico	54	4
Arizona	17	5
Utah [3 4]	48	26
Nevada	1	
PACIFIC		
Washington	52	23
Oregon	17	21
California	267	258
Total	2,971	2,965
34 weeks	149,750	110,137

[1] Typhus fever, week ended August 23, 1941, 98 cases as follows: New York, 2; South Carolina, 3; Georgia, 44; Florida, 5; Alabama, 9; Mississippi, 2; Louisiana, 10; Texas, 23.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended August 23, 1941, 26 cases as follows: Pennsylvania, 2; Ohio, 3; Indiana, 1; Iowa, 2; Missouri, 2; Maryland, 5; Virginia, 4; West Virginia, 1; North Carolina, 1; Louisiana, 1; Montana, 1; Colorado, 1; Utah, 2.
[4] Period ended earlier than Saturday.

HUMAN CASE OF PLAGUE IN SISKIYOU COUNTY, CALIF.

A fatal case of human plague was reported in Siskiyou County, Calif., on August 11, 1941, with onset on August 6 or 7, and death on August 9. The case occurred in a 5-year-old boy living 1 mile northwest of Mount Shasta City. The diagnosis was confirmed by animal inoculation and the isolation of pure cultures.

The case occurred about 50 miles from the locality in which a fatal case was reported in the same county in June.[1] It represents a new focus of the infection in California and indicates widespread rodent plague in the county.

[1] Public Health Reports, July 4, 1941, p. 1400.

PLAGUE INFECTION IN A GROUND SQUIRREL IN HARNEY COUNTY, OREG.

Under date of August 14, 1941, plague infection was reported found, upon examination at the laboratory in San Francisco, Calif., in tissue from a ground squirrel, *C. oregonus*, shot July 30 at Fish Lake, 80 miles southeast of Burns, Harney County, Oreg.

WEEKLY REPORTS FROM CITIES

City reports for week ended August 9, 1941

This table lists the reports from 135 cities of more than 10,000 population distrib... throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine.											
Portland	0	------	0	0	0	0	0	0	0	1	21
New Hampshire:											
Concord	0	------	0	0	1	0	0	1	0	0	11
Manchester	0	------	0	0	0	1	0	0	0	0	7
Nashua	0	------	0	0	1	0	0	0	0	0	6
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	0	0	0	0	0	0	1	10
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	1	------	0	15	5	18	0	5	5	34	167
Fall River	0	------	0	2	2	4	0	0	0	2	24
Springfield	0	------	0	4	0	6	0	1	0	2	32
Worcester	0	------	0	0	1	1	0	1	0	17	30
Rhode Island:											
Providence	1	------	0	2	1	2	0	1	0	25	52
Connecticut:											
Bridgeport	0	------	0	4	0	0	0	0	0	0	24
Hartford	0	------	0	1	0	1	0	1	0	0	26
New Haven	0	------	0	3	0	1	0	0	0	9	28
New York:											
Buffalo	0	------	0	2	5	0	0	2	0	9	110
New York	12	1	1	35	34	15	0	70	9	130	1,285
Rochester	0	------	0	1	0	0	0	0	0	3	65
Syracuse	0	------	0	2	0	0	0	0	0	9	39
New Jersey:											
Camden	0	------	0	0	1	0	0	0	0	7	25
Newark	0	------	0	15	6	4	0	5	0	21	89
Trenton	0	1	0	1	0	0	0	2	0	0	29
Pennsylvania:											
Philadelphia	0	------	0	1	12	7	0	17	2	31	398
Pittsburgh	0	------	2	9	4	3	0	7	2	36	138
Reading	0	------	0	0	1	0	0	0	0	0	18
Scranton	0	-----	-------	1	-------	0	0	-------	0	1	--------
Ohio:											
Cincinnati	0	------	0	9	0	2	0	4	1	9	115
Cleveland	0	1	1	0	4	11	0	13	0	73	186
Columbus	0	------	0	2	0	0	0	3	0	16	70
Toledo	0	------	0	13	3	2	0	1	0	39	73
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	9
Fort Wayne	0	------	0	0	3	0	0	0	0	0	39
Indianapolis	0	------	0	5	4	2	0	7	0	11	99
Muncie	0	------	0	0	1	0	0	2	0	0	15
South Bend	0	------	0	0	0	0	0	0	0	0	25
Terre Haute	1	------	0	0	1	0	0	0	0	0	22
Illinois											
Alton	0	------	0	0	0	0	0	0	0	0	8
Chicago	7	2	1	9	20	9	0	37	1	121	633
Elgin	1	------	0	0	0	0	0	0	0	4	11
Moline	0	------	0	0	0	0	0	0	0	2	9
Springfield	0	------	0	12	2	0	0	0	0	0	18
Michigan:											
Detroit	0	------	0	20	7	9	0	15	0	113	220
Flint	0	------	0	2	4	0	0	0	0	2	28
Grand Rapids	0	------	0	4	0	1	0	0	0	8	29
Wisconsin:											
Kenosha	0	------	0	0	0	1	0	0	0	0	7
Madison	0	------	0	4	0	0	0	0	0	1	9
Milwaukee	0	------	0	35	1	14	0	3	0	122	96

City reports for week ended August 9, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Wisconsin—Con.											
Racine	0	------	0	13	0	2	0	1	0	8	17
Superior	0	------	0	5	0	0	0	0	0	6	10
Minnesota:											
Duluth	0	------	0	0	0	0	0	0	0	11	14
Minneapolis	0	------	0	2	2	2	0	1	0	16	101
St. Paul	0	------	0	2	0	0	0	2	0	16	54
Iowa:											
Cedar Rapids	0	------	------	1	------	1	0	------	0	0	------
Davenport	0	------	------	1	------	0	0	------	0	0	------
Des Moines	0	------	------	0	------	0	0	------	0	14	26
Sioux City	1	------	------	0	------	0	0	------	0	16	------
Waterloo	0	------	------	1	------	0	0	------	0	4	------
Missouri:											
Kansas City	0	------	0	3	4	3	0	5	0	4	91
St. Joseph	0	------	0	0	2	0	0	0	0	0	22
St. Louis	0	------	0	6	6	2	0	7	1	9	173
North Dakota:											
Grand Forks	1	------	------	1	------	0	0	------	0	0	------
Minot	0	------	0	4	0	0	0	0	0	1	7
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	0	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	6
Nebraska:											
Lincoln	0	------	------	4	------	1	0	------	0	4	------
Omaha	0	------	0	5	1	0	0	0	0	2	44
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	6	8
Topeka	0	------	0	0	0	0	0	2	0	15	26
Wichita	0	------	0	0	6	0	0	0	1	3	27
Delaware:											
Wilmington	0	------	0	1	4	0	0	1	0	0	30
Maryland:											
Baltimore	0	------	0	43	7	5	0	12	1	59	213
Cumberland	0	------	0	1	0	0	0	0	0	0	11
Frederick	0	------	0	1	0	0	0	0	0	0	4
Dist. of Col.											
Washington	1	------	0	11	11	3	0	9	0	21	139
Virginia:											
Lynchburg	1	------	0	1	0	0	0	0	0	1	7
Norfolk	0	------	0	5	1	0	0	0	0	0	30
Richmond	1	------	0	2	3	0	0	2	0	0	71
Roanoke	0	------	0	0	0	1	0	0	0	0	13
West Virginia:											
Charleston	0	------	0	0	3	0	0	3	0	0	39
Huntington	1	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	0	0	0	0	0	0	0	19
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	2	0	1	0	0	0	12	11
Wilmington	0	------	0	0	1	0	0	0	0	11	11
Winston-Salem	0	------	0	4	0	0	0	2	1	2	------
South Carolina:											
Charleston	0	1	0	0	1	1	0	0	2	0	20
Florence	0	------	------	0	------	0	0	------	0	1	------
Greenville	0	------	0	0	0	0	0	0	1	1	10
Georgia:											
Atlanta	3	------	0	0	2	2	0	9	2	4	70
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	0	------	0	0	0	0	0	0	0	4	27
Florida:											
Miami	0	1	1	6	4	0	0	2	1	11	37
St. Petersburg	0	------	0	0	0	0	0	0	4	0	15
Tampa	0	------	0	0	2	0	0	1	0	0	25
Kentucky:											
Ashland	0	------	0	0	0	1	0	0	0	0	8
Covington	0	------	0	0	0	1	1	0	0	0	14
Lexington	0	------	0	0	0	0	0	0	0	5	16
Louisville	1	1	0	3	7	2	0	2	2	10	56
Tennessee:											
Knoxville	0	4	0	0	0	1	0	3	1	1	29
Memphis	0	------	0	2	1	0	0	2	0	18	90
Nashville	0	------	0	1	5	0	0	6	1	10	52
Alabama:											
Birmingham	2	------	0	0	1	0	0	4	5	1	65
Mobile	0	2	0	0	2	0	0	1	0	0	19
Montgomery	0	------	------	0	------	1	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	1	------
Little Rock	0	------	0	1	2	0	0	1	0	0	13

City reports for week ended August 9, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	8
New Orleans	0	------	0	0	6	0	0	10	1	15	119
Shreveport	0	------	0	0	0	0	0	4	0	0	24
Oklahoma:											
Oklahoma City	0	------	0	0	6	0	0	2	1	0	57
Tulsa	0	------	0	1	1	1	0	2	1	1	20
Texas:											
Dallas	2	------	0	7	1	0	0	1	0	1	76
Fort Worth	0	------	0	1	3	0	0	2	0	0	38
Galveston	0	------	0	0	0	0	0	1	0	0	20
Houston	1	------	1	0	2	0	0	5	0	1	68
San Antonio	0	5	3	0	6	0	0	11	0	0	74
Montana:											
Billings	0	------	0	0	0	1	0	0	0	3	9
Great Falls	0	------	0	0	0	0	0	0	0	3	11
Helena	0	------	0	0	0	0	0	0	0	1	3
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	9
Colorado:											
Colorado Springs	0	------	0	0	1	0	0	1	0	0	19
Denver	4	7	0	4	7	0	0	3	0	64	81
Pueblo	0	------	0	3	1	1	0	0	0	0	11
New Mexico:											
Albuquerque	0	------	0	1	3	0	0	0	1	1	10
Arizona:											
Phoenix	0	6	--------	1	-------	0	0	-------	0	0	--------
Utah:											
Salt Lake City	0	------	0	2	1	0	0	0	0	27	39
Washington:											
Seattle	0	------	0	0	4	2	0	2	0	29	73
Spokane	0	------	0	0	0	6	0	0	0	6	36
Tacoma	0	------	0	0	0	0	0	0	1	15	31
Oregon:											
Portland	1	------	0	1	3	1	0	1	0	1	72
Salem	0	1	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	3	2	0	11	2	6	0	21	0	59	340
Sacramento	0	------	0	0	2	0	0	1	0	11	35
San Francisco	0	------	0	0	4	2	0	5	1	10	173

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	0	0	1
New York:			
Buffalo	2	0	1
New York	1	1	16
New Jersey:			
Camden	0	0	1
Newark	0	0	1
Pennsylvania:			
Philadelphia	1	0	2
Ohio:			
Cleveland	3	0	27
Toledo	0	0	1
Illinois:			
Chicago	0	0	6
Michigan:			
Detroit	0	0	3
Flint	0	0	1
Wisconsin:			
Superior	0	0	3
Minnesota:			
St. Paul	0	0	10
Maryland:			
Baltimore	2	1	9
District of Columbia:			
Washington	0	0	2
Virginia:			
Norfolk	0	0	1

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
West Virginia:			
Huntington	1	1	0
South Carolina:			
Charleston	0	0	1
Georgia:			
Atlanta	0	0	6
Savannah	0	0	4
Florida:			
Miami	0	0	1
Tampa	0	0	1
Tennessee:			
Knoxville	0	0	1
Alabama:			
Birmingham	1	1	9
Montgomery	0	0	2
Louisiana:			
New Orleans	0	0	1
Shreveport	0	1	1
Texas:			
Dallas	0	0	1
Utah:			
Salt Lake City	0	0	2
Oregon:			
Portland	0	1	0
California:			
Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: New York, 1; St. Paul, 1; Sioux City, 2; Grand Forks, 21; Minot, 9; Aberdeen, 4; Sioux Falls, 2; Baltimore, 1. Deaths: New York, 2; St. Paul, 1; Baltimore, 1.

Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 2.

Typhus fever.—Cases: New York, 1; Atlanta, 1; Savannah, 4; Miami, 6; Birmingham, 1; New Orleans, 2; Fort Worth, 3; Houston, 1.

Rates (annual basis) per 100,000 population for a group of 89 selected cities (population, 1940, 33,897,000)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Aug. 9, 1941	6.2	3.4	1.4	50.5	34 0	23.2	0.0	50.8	5.7	197.5
Average, 1936-1940	10.9	3.7	1.6	55.2	40.0	35.0	4.7	52.4	10.3	207.4

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 19, 1941.—During the week ended July 19, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		5		2	4			1	3	15
Chickenpox		1		35	83	7	30	23	10	189
Diphtheria	1	12	1	14	5	3	2	1		39
Dysentery				1					1	2
Influenza		9			3				30	42
Measles			3	154	176	10	12	4	38	397
Mumps				37	53	3	13	3	2	111
Pneumonia		1			3	1			2	7
Poliomyelitis						47				47
Scarlet fever		2	7	44	76	1	3	7	4	144
Smallpox								1		1
Tuberculosis	2	6	7	168	39	5		1		228
Typhoid and paratyphoid fever		1	1	21	1	1		1	1	27
Whooping cough		4		81	170		5		23	283

Poliomyelitis.—During the week ended August 22, 1941, 162 cases of poliomyelitis were reported in the Province of Manitoba, bringing the total number of cases to 597, of which 188 cases originated in Winnipeg. The mortality rate has been 2 percent. In the Province of New Brunswick for the week ended August 16, 135 cases of poliomyelitis with 9 deaths were reported and during the following week 146 cases were reported up to August 22, including 1 case in St. George, Charlotte County, near the Bay of Fundy.

Manitoba—Encephalitis.—For the week ended August 22, 1941, 127 new cases of encephalitis were reported in the Province of Manitoba making a total of 149 cases to date, with a death rate of 9 percent. Daily reports of new cases give no evidence of abatement of the epidemic.

CUBA

Habana—Communicable diseases—4 weeks ended July 26, 1941.—During the 4 weeks ended July 26, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	17	2	Scarlet fever	1	
Leprosy	1		Tuberculosis	5	5
Malaria	6	1	Typhoid fever	45	5
Measles	19	3			

Provinces—Notifiable diseases—4 weeks ended July 19, 1941.—During the 4 weeks ended July 19, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	2		1	6		5	14
Chickenpox						6	6
Diphtheria		13	1	1			15
Hookworm disease		20		2		4	26
Leprosy						1	1
Malaria	26	8	1	15	4	238	292
Measles		14	4				18
Poliomyelitis					1		1
Scarlet fever						1	1
Tuberculosis	26	16	15	30	3	33	123
Typhoid fever	16	80	25	56	22	40	239
Undulant fever						1	1
Whooping cough		1	3			1	5

[1] Includes the city of Habana.

SWEDEN

Notifiable diseases—May 1941.—During the month of May 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	19	Poliomyelitis	8
Diphtheria	3	Scarlet fever	1,435
Dysentery	39	Syphilis	24
Epidemic encephalitis	1	Typhoid fever	3
Gonorrhea	750	Undulant fever	5
Paratyphoid fever	19		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–May 1941	June 1941	July 1941—week ended— 5	12	19	26
ASIA							
China:							
Canton	C	131	65				
Hong Kong	C	832	165	62	59		
Macao	C	162	247		80		52
Shanghai	C			3	6	8	19
India:							
Calcutta	C	1,668	158				
Rangoon	C	46					
India (French)	C	21					
Japan: Taiwan	C	[1] 2					

[1] For February and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths]

Place		January–May 1941	June 1941	July 1941—week ended—			
				5	12	19	26
AFRICA							
Belgian Congo	C	3	3				
British East Africa:							
Kenya	C	26	42				
Uganda	C	58	6				
Egypt Port Said	C				8		
Madagascar	C	191	3				
Morocco	C	1,144	344	90	63	61	60
Casablanca [1]							
Tunisia: Tunis	C	2					
Union of South Africa	C	59					
ASIA							
China: Foochow	C	3					
Dutch East Indies:							
Java and Madura	C	301					
West Java	C	205					
India:							
Calcutta	C	3					
Rangoon	C	6					
Indochina (French)	C		17				
Palestine: Haifa	C						2
Plague-infected rats		10					
Thailand: Lampang Province	C	1					
NORTH AMERICA							
Canada—Alberta—Plague-infected ground squirrel			1				
SOUTH AMERICA							
Argentina:							
Cordoba Province	C	[2] 16	[3] 5				
Santa Fe Province—Plague-infected rats		67					
Peru							
Ancash Department	C	1					
Lambayeque Department	C	2					
Libertad Department	C	6					
Lima Department	C	6					
Moquegua Department—Ilo	C	4	3				
Piura Department	C	2					
OCEANIA							
Hawaii Territory: [4] Plague-infected rats		35	9		8		
New Caledonia	C	9					

[1] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco where several deaths had been reported.
[2] Includes 2 cases of pneumonic plague.
[3] Includes 1 case of pneumonic plague.
[4] During April and May, 4 lots of plague-infected fleas were reported in Hawaii Territory.

SMALLPOX

[C indicates cases; D, deaths]

AFRICA							
Algeria	C	122	34		18		
Belgian Congo	C	48					
British East Africa	C	17	2				
Dahomey	C	452	2		6	4	
French Guinea	C	45					
Ivory Coast	C	30	2		7		
Morocco	C	31					
Nigeria	C	607	30				
Niger Territory	C	221	8		9	11	9
Portuguese East Africa	C	9					
Rhodesia: Southern	C	86					
Senegal	C	52	4		1		2
Sierra Leone	C	15					
Sudan (Anglo-Egyptian)	C	7					
Sudan (French)	C	19					
Union of South Africa	C	94					

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths]

Place		January-May 1941	June 1941	July 1941—week ended—			
				5	12	19	26
ASIA							
Ceylon	C	40	12				
China	C	198	18	4	3	2	1
Chosen	C	464					
India	C	10, 580	35				
India (French)	C	6					
India (Portuguese)	C	44					
Indochina (French)	C	702	120		37		36
Iran	C	8					
Iraq	C	919					
Japan	C	127					
Straits Settlements	C	1					
Syria	C	1					
Thailand	C	218	13				
EUROPE							
France	C	1					
Portugal	C	26	5				
Spain	C	129					
NORTH AMERICA							
Canada	C	22					
Dominican Republic	C	2					
Guatemala	C	5					
Mexico	C	22					
SOUTH AMERICA							
Brazil	C		1				
Colombia	C	281	2				
Paraguay	C	8					
Peru	C	249					
Uruguay	C	7					
Venezuela (alastrim)	C	154	7		1		

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January-May 1941	June 1941	July 1941—week ended—			
				5	12	19	26
AFRICA							
Algeria	C	5, 597	1, 964		578		
British East Africa: Kenya	C	[1] 2					
Egypt	C	4, 214					
Morocco	C	385	252	39	39	23	32
Sierra Leone	C	5					
Tunisia	C	2, 764	962	191	183	79	
Union of South Africa	C	116	2				
ASIA							
China	C	152	25				
Chosen	C	68					
Iran	C	105					
Iraq	C	37					
Japan	C	295	2				
Palestine	C	23					
Straits Settlements	C	4	1				
EUROPE							
Bulgaria	C	145	34	7	2		3
Germany	C	824	191	28	33	67	
Gibraltar	C	2					
Greece	C	7					
Hungary	C	233	60	2			
Irish Free State	C	26					
Poland	C	530					
Portugal	C	5					
Rumania	C	562	16	4	12		2
Spain	C	2, 693	1, 674				
Switzerland	C	2	3				
Turkey	C	543					
Yugoslavia	C	78					

[1] For the month of April.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths]

Place		January-May 1941	June 1941	July 1941—week ended—			
				5	12	19	26
NORTH AMERICA							
Guatemala	C	103	6				
Mexico	C	61	2			1	
Panama Canal Zone	C	3					
SOUTH AMERICA							
Bolivia	C	75					
Brazil	C		1				
Chile	C	66	9	1			
Ecuador	C	65					
Peru	C	453					
Venezuela	C	26	5				
OCEANIA							
Australia	C	8					
Hawaii Territory	C	13	3	1			

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-May 1941	June 1941	July 1941—week ended—			
				5	12	19	26
AFRICA							
Belgian Congo:							
Kimvulu	C		1				
Libenge	C		1				
French Equatorial Africa:							
Gabon	C	2					
Mayumba	C		4				
Gold Coast: Accra	C	1					
Ivory Coast [1]	C	[2] 3			[3] 1		
Spanish Guinea	D	4					
SOUTH AMERICA [4]							
Brazil:							
Bahia State	D		2				
Para State	D		1				
Colombia:							
Antioquia Department	D	2					
Boyaca Department	D	6	1		1		
Intendencia of Meta	D	2	2				
Santander Department	D	3	1				
Tolima Department	D	1					
Peru: Junin Department	C	5					

[1] During the week ended Aug. 9, 1 fatal case of yellow fever was reported in Dimbokro, Ivory Coast.
[2] Includes 2 suspected cases.
[3] Suspected.
[4] All yellow fever reported in South America is of the jungle type unless otherwise specified.

X

Public Health Reports

VOLUME 56 **SEPTEMBER 5, 1941** NUMBER 36

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE 1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • SEPTEMBER 5, 1941 • *No. 36*

THE DIVERSE ETIOLOGY OF EPIDEMIC INFLUENZA [1]

By E. H. Lennette, E. R. Rickard, G. K. Hirst, and F. L. Horsfall, Jr.

Numerous studies on the cause of epidemic influenza have shown that the disease results from infection by a virus. Following the discovery by Smith, Andrewes, and Laidlaw (*1*) of what is now termed influenza A virus (*2*), numerous workers in laboratories in various parts of the world confirmed their findings and agreed with the view that this agent was responsible for many cases of epidemic influenza. Some modification of this broad concept became necessary when Francis (*3*) found that an epidemic of the disease which occurred in California could not be shown to have been caused by this virus. Subsequently Stuart-Harris, Smith, and Andrewes (*4*), as well as Rickard, Lennette, and Horsfall (*5*), demonstrated that only a certain proportion of cases studied in localized epidemics were due to this agent. These reports made it evident that epidemic influenza was not a single etiological entity and indicated that at least two distinct causal agents were capable of producing the disease.

Recently Magill (*6*) and Francis (*7*), independently and simultaneously, described influenza viruses which were different from influenza A virus and demonstrated the causal relationships of these agents to the disease. One of these new agents has been termed influenza B virus (*7*). The available published data (*6*, *7*, *8*, *9*) seem to indicate that influenza A (*2*) and influenza B (*7*) are etiologically distinct although clinically similar diseases.

During the past year a number of epidemics of influenza occurred in various parts of this country and in some of the Caribbean Islands. The availability of two distinct etiological agents has made possible a study of the cause of the disease in a number of representative cases from certain of these epidemics. The results have been unexpected. It is the purpose of this paper to present evidence indicat-

[1] From the Laboratories of the International Health Division of The Rockefeller Foundation, New York.

ing that cases of influenza in one epidemic, even in a single institution, may be due to infection by one or more of at least three distinct agents.

MATERIAL AND METHODS

Viruses.—The PR8 strain *(10)* of influenza A virus and the Lee strain (7) of influenza B virus were used throughout this study. Both viruses had been established in mice. The former had been through more than 330 serial passages, while more than 50 passages of the latter had been made in this species. Standard suspensions of mouse lungs infected with one or the other virus were prepared as described previously *(11)* and were stored in a low temperature cabinet *(12)* at −76° C. Each time either virus was used in a neutralization test a titration was made to determine the infectiousness of the suspension for mice.

Serum.—Acute-phase sera were obtained from the majority of individuals who provided throat washings, as well as from numerous other cases in each epidemic. These sera were taken in the early stages of the disease, usually between the first and fourth day after the clinical onset. Convalescent sera were obtained from the same individuals between 2 and 3 weeks later. The sera were stored at 4° C.

Neutralization test.—Neutralization tests with human sera were carried out exactly as previously described *(13)*. Serial fourfold dilutions of serum were mixed with constant amounts of either the PR8 strain of influenza A virus or the Lee strain of influenza B virus. Usually 300 fifty percent mortality doses of influenza A virus and either 30 or 300 of influenza B virus were used. In almost every instance acute-phase and convalescent sera from one patient were run in the same test. Serum dilution and virus titration end points were determined by the 50 percent end point method of Reed and Muench *(14)*, and from these figures the neutralizing capacity of each serum was calculated as described previously *(15)*. It has been found that the linear relationship between the quantity of serum used and the quantity of virus neutralized was also operative with influenza B virus. A significant increase in neutralizing antibodies against either virus was considered to have occurred when the titer of the convalescent serum was found to be fourfold or more higher than that of the acute-phase serum. A fourfold increase in titer corresponds to an increase in neutralizing capacity of log 0.86 and exceeds the experimental error of the method by at least 3 times *(15)*.

Complement fixation tests.—Complement fixation tests were carried out in a manner identical to that described previously *(5)*. Mouse lung antigens were prepared with either the PR8 strain of influenza A virus or the Lee strain of influenza B virus. These antigens were

standardized against pools of convalescent human sera of known complement-fixing titer for either antigen. Complement-fixing antibody titers were determined for both the acute-phase and the convalescent sera in the same test. The serum titer was taken as equal to that dilution which gave 3+ or 4+ fixation with the particular antigen used. A significant increase in complement-fixing titer was considered to have occurred when the convalescent serum titer was one or more dilutions higher than the titer of the acute-phase serum.

Throughout this study the neutralization test has been considered more specific and more reliable than the complement fixation test. Consequently, whenever discrepancies occurred in the results obtained by these two tests on sera from one case, the results of the neutralization test were taken to be correct.

Throat washings.—Throat washings were obtained by the method previously described (*13*) from representative and clinically typical cases of influenza during the first few days of the disease. The throat washings were rapidly frozen in solid carbon dioxide and stored in a low temperature cabinet (*12*) at −76° C. The presence of either influenza A virus or influenza B virus in a throat washing was determined by the inoculation of either ferrets or Syrian hamsters. The former animals were given 2 cc. and the latter 0.5 cc. of untreated throat washing intranasally under ether anesthesia. The clinical course of inoculated ferrets was followed carefully; temperatures were taken twice daily, and the animals were kept in special isolation cubicles (*16*) during the observation period. From 10 to 14 days after inoculation the ferrets and hamsters were bled from the heart. The sera so obtained, as well as control normal sera from the same animals, were run in neutralization tests against approximately 30 fifty percent mortality doses of influenza A virus or influenza B virus. These small quantities of the two viruses were used in order that very small amounts of neutralizing antibody could be detected. It has been our experience that clinical evidences of infection by influenza A virus in ferrets are unreliable. The demonstration of a specific antibody response against either influenza A or B virus in inoculated animals is, however, certain evidence that infection by one or the other of these agents has occurred.

EXPERIMENTAL

During the winter of 1940 localized epidemics of clinically mild influenza occurred in the vicinity of New York City. At approximately the same time a widespread outbreak of the disease, also clinically mild, occurred in North Carolina. Neutralization and complement fixation tests with influenza A virus were carried out with acute-phase and convalescent sera obtained from a number of representative cases in each of these outbreaks. In only four cases was a

significant increase in antibodies against influenza A virus demonstrated in the convalescent sera. Furthermore, ferrets inoculated with throat washings taken from cases in the North Carolina epidemic failed to produce any antibodies against influenza A virus. These results indicated that less than 10 percent of the cases selected for study in these epidemics had been infected by influenza A virus. Subsequently when influenza B virus became available, the pairs of human sera and the sera obtained from ferrets after the inoculation of throat washings were restudied in tests against this agent.

The results of these tests with throat washings and sera from cases in the New York and North Carolina epidemics are shown in table 1. In the former epidemic 24 cases were studied. Two showed during convalescence a significant increase in neutralizing antibodies against influenza A virus only. Thirteen had a significant increase in antibodies against influenza B virus. One case was found to have produced additional antibodies against both viruses. In this case the neutralization tests with both agents were repeated, and the increase in antibodies against both was confirmed. Eight cases showed no significant alteration in the concentration of antibodies against either virus during convalescence. Throat washings from this epidemic were not tested in ferrets.

TABLE 1.—*Results of studies of sera and throat washings from cases of clinical influenza in epidemics during February 1940*

Place	Cases tested for increases in antibodies									Throat washings tested			
	Number tested	Significant increase demonstrated against—						Significant increase not demonstrable		Number tested	Viruses demonstrated		Virus not demonstrable
		A virus		B virus		Both A and B							
		Number	Percent	Number	Percent	Number	Percent	Number	Percent		A	B	
New York	24	2	8	13	54	1	4	8	34	0	----	----	----
North Carolina	17	0	0	8	47	1	6	8	47	9	0	5	4
Total	41	2	5	21	51	2	5	16	39	9	0	5	4

In the North Carolina epidemic 17 cases were studied. None of these cases showed a significant increase in neutralizing antibodies against influenza A virus alone. Eight had a significant increase in antibodies against influenza B virus. One case produced additional antibodies against both viruses. Eight cases had the same concentrations of antibodies against both agents in the acute phase and during convalescence. Throat washings from 9 cases were inoculated in ferrets. None of the ferrets when bled 2 weeks later possessed neutralizing antibodies against influenza A virus. However, 5 had antibodies against influenza B virus. Three of these 5 washings were

obtained from patients who showed during convalescence an increase in antibodies against influenza B virus. One was obtained from the patient who was found to have shown an increase in antibodies against both influenza A and B viruses. The other was obtained from a patient on whom no convalescent serum was available.

In the light of previous studies on the etiology of epidemics of influenza, these results were quite unexpected since they seemed to indicate clearly that, whereas some cases in the New York epidemic had been infected with influenza A virus, others which occurred simultaneously had been infected by influenza B virus. Furthermore, the fact that no evidence was obtained of infection by either of these two viruses in 39 percent of the representative cases selected for study in the two epidemics suggested the possibility that some other agent, or agents, unrelated antigenically either to influenza A virus or to influenza B virus, had been responsible for the infections in these instances.

During the summer of 1940 widespread outbreaks of influenza occurred in some of the Caribbean Islands. The epidemics in Puerto Rico and Cuba seemed to have commenced during the latter part of June and reached their peaks during July and August, respectively. A few weeks after these two epidemics had begun numerous individuals in both islands who had not yet contracted influenza were given a single subcutaneous injection of a complex vaccine against influenza A (*17*). Throat washings, as well as acute-phase and convalescent sera, were obtained from a number of representative cases in these two epidemics and were tested by the methods described above. In some instances these specimens were obtained from patients who had been vaccinated a few days before the onset of influenza. These latter individuals have been excluded from the present analysis of the incidence of influenza A because of the impossibility of determining whether observed increases in neutralizing antibodies against influenza A virus resulted from the administration of the vaccine or natural infection by the virus.

The results of tests with throat washings and serum from cases in the epidemics in Puerto Rico and Cuba are shown in table 2. In the former epidemic 22 cases were studied. In 12 cases a significant increase in neutralizing antibodies against influenza A virus was demonstrated during convalescence. In 10 cases no increase in antibodies against this virus was found. Sera from 21 of these cases were also studied in neutralization tests against influenza B virus, and in no instance was a significant increase in antibodies demonstrated. Consequently, in 9 cases additional antibodies were not produced against either virus. Ferrets were inoculated with throat washings from 16 cases, hamsters were inoculated with throat washings from 4 cases, and both a ferret and hamster were inoculated with

a throat washing from 1 case. In no instance did the ferret sera obtained 2 weeks after these inoculations contain neutralizing antibodies against influenza A virus. One hamster was found to have produced antibodies against this virus following inoculation with a throat washing from a patient who showed an increase in antibodies against influenza A virus. However, this same throat washing, when given to a ferret, did not stimulate the production of antibodies against this agent.

TABLE 2.—*Results of studies of sera and throat washings from cases of clinical influenza in epidemics during July and August 1940*

Place	Cases tested for increases in antibodies									Throat washings tested			
	Number tested	Significant increase demonstrated against—						Significant increase not demonstrable		Number tested	Viruses demonstrated		Virus not demonstrable
		A virus		B virus		Both A and B							
		Number	Percent	Number	Percent	Number	Percent	Number	Percent		A	B	
Puerto Rico	22	12	60	0	0	0	0	9	43	21	1	0	20
Cuba													
Institution 1	53	22	41	0	0	1	2	30	57	10	1	0	9
Institution 2	31	0	0	25	81	0	0	6	19	17	0	9	8
Total	106	34	33	25	24	1	1	45	42	48	2	9	37

In the Cuban epidemic 84 cases were studied. These cases occurred simultaneously in two institutions in the same city. The results in these two outbreaks are shown separately in table 2. In Institution 1, 53 cases were investigated and in 22 a significant increase in antibodies against influenza A virus was demonstrated during convalescence. One case was found to have significantly increased concentrations of antibodies against both influenza A and B virus. The remaining 30 cases failed to manifest an increase in antibodies against either virus during convalescence. Throat washings from 10 cases in Institution 1 were inoculated in ferrets. Seven were also given to hamsters. Four of these throat washings were obtained from cases in which an increase in antibodies against influenza A virus was demonstrated. One of these washings stimulated the formation of neutralizing antibodies in the inoculated ferret. The other 3 washings, as well as the 6 obtained from cases which manifested no increase in antibodies against either virus, failed to cause the production of antibodies against influenza A or B virus in ferrets or hamsters.

In Institution 2, 31 cases were investigated. None was found to have an increased concentration of antibodies against influenza A virus during convalescence. In 25 cases a significant increase in antibodies against influenza B virus was demonstrated. The re-

maining 6 cases manifested no increase in antibodies against either virus during convalescence. Throat washings from 17 cases in Institution 2 were inoculated in ferrets, and 16 were also given to hamsters. Sixteen washings were obtained from cases which showed an increase in antibodies against influenza B virus during convalescence. Nine of these washings stimulated the production of neutralizing antibodies against this virus in the inoculated animals. In one instance both the ferret and the hamster possessed antibodies when bled 2 weeks after inoculation. In 7 instances the ferret had developed antibodies, but the hamster had not. In 1 instance the ferret did not possess antibodies while the hamster did. In the case of the other 8 washings none of the inoculated animals developed antibodies against influenza B virus. In no instance were antibodies against influenza A virus demonstrated following inoculation of ferrets or hamsters with the washings obtained in Institution 2.

The results obtained in the epidemics in Puerto Rico and Cuba were even more unexpected than those obtained in the outbreaks in New York and North Carolina. It seems apparent that both influenza A virus and influenza B virus were present at the same time in the Cuban epidemic and that, while a moderate proportion of cases in Institution 1 were infected by the former virus, a larger proportion of cases in Institution 2 were infected by the latter virus. Of equal significance is the fact that 40 percent or more of the cases studied in both insular epidemics manifested no demonstrable evidence of having been infected by either virus.

During December 1940 and January 1941 widespread outbreaks of influenza occurred in various parts of the United States. A number of cases which occurred among the general population in Kentucky, Tennessee, New York, and Connecticut were studied. A larger number of cases which occurred in various institutions or Army camps in Kentucky, New York, Florida, and Alabama were also investigated. Throat washings, as well as acute-phase and convalescent sera, were obtained from representative cases in each of these outbreaks and were tested by the methods described above. In Florida and Alabama, groups of individuals in various institutions had been given a single subcutaneous injection of a complex vaccine against influenza A (*17*) approximately 4 months before the epidemic occurred. Cases of influenza which occurred in these vaccinated groups were included in this study of the etiology of the disease since it was found that the usual laboratory procedures served to establish the etiological agent responsible for these cases as readily as in unvaccinated individuals.

The results of tests with throat washings and sera from cases in the epidemics occurring in Kentucky, Tennessee, New York, Connecticut, Florida, and Alabama are shown in table 3. The results

obtained in the various institutional outbreaks are presented separately. In each case acute-phase and convalescent sera were tested against influenza A virus by either complement fixation or neutralization, or both. With the sera from almost all of these cases, complement fixation tests were also carried out against influenza B virus. It will be observed that wide differences in the proportion of cases in which a significant increase in antibodies against influenza A virus was demonstrated were encountered in the various outbreaks. For example, only 19 percent and 37 percent of the cases studied in Camp 1 in Kentucky and in Institution 7 in Alabama, respectively, had produced additional antibodies against this virus. On the other hand, in no fewer than 95 percent and 86 percent of the cases studied in Institutions 4 and 2, respectively, in Alabama, increased antibody levels against influenza A virus were demonstrated during convalescence. It will also be observed that in only 2 of the cases which showed no additional antibodies against influenza A virus was an increase in antibodies against influenza B virus demonstrated. In 4 cases an increase in antibodies against both viruses was found. In 2 of these latter 4 cases the fact that antibodies against one or both viruses had been produced was confirmed by neutralization tests. Finally, it will be noted that in 327 cases in which tests with acute-phase and convalescent sera were carried out against both viruses no evidence of an antibody response directed against either agent was demonstrated.

TABLE 3.—*Results of studies of sera and throat washings from cases of clinical influenza in epidemics during December 1940 and January 1941*

Place	Institution	Cases tested for increases in antibodies										Throat washings tested			
		Significant increase demonstrated against—								Significant increase not demonstrable		Number tested	Viruses demonstrated		Virus not demonstrable
		A virus			B virus			Both A and B							
		Number tested	Number positive	Percent positive	Number tested	Number positive	Percent positive	Number positive	Percent positive	Number	Percent		A	B	
Kentucky	1	37	7	19	37	0	0	0	0	30	81	10	4	0	6
	2	37	26	70	37	1	2.7	1	2.7	9	24	0	0	0	0
Tennessee	----	39	23	59	39	0	0	0	0	16	41	0	0	0	0
New York	----	68	33	49	66	0	0	1	1.5	32	48	0	0	0	0
Connecticut	----	19	16	84	19	0	0	1	5.3	2	11	0	0	0	0
Florida	1	85	64	75	72	0	0	1	1.4	19	26	9	7	0	2
	2	208	134	64	194	1	0.5	0	0	73	38	0	0	0	0
	3	70	51	73	68	0	0	0	0	17	25	0	0	0	0
Alabama	1	192	139	72	192	0	0	0	0	53	28	5	4	0	1
	2	42	36	86	42	0	0	0	0	6	14	0	0	0	0
	3	172	140	81	172	0	0	0	0	32	18	1	0	0	1
	4	101	96	95	100	0	0	0	0	4	4	1	1	0	0
	5	29	20	69	28	0	0	0	0	8	29	5	4	0	1
	6	37	23	62	36	0	0	0	0	13	33	0	0	0	0
	7	24	9	37	22	0	0	0	0	13	59	0	0	0	0
Total	----	1,160	817	70	1,124	2	0.2	4	0.4	327	29	31	20	0	11

Throat washings obtained from 31 cases in these various outbreaks were inoculated intranasally in ferrets. In 23 of these cases an increase in antibodies against influenza A virus was demonstrated during convalescence. Of the ferrets inoculated with these throat washings 20 were found to have produced antibodies against this virus when bled 2 weeks later, while none had produced antibodies against influenza B virus. Eleven of the 31 ferrets gave no antibody response to either virus.

The results obtained in the 15 separate outbreaks studied in these 6 States differed markedly from those found in the studies of earlier epidemics during 1940. In all but three of these outbreaks the evidence indicated that influenza A virus had been causally related to more than 50 percent of the cases studied. On the other hand, evidence which suggested that influenza B virus had caused infections was obtained in only 6 cases, of which 4 also showed evidence of infection by influenza A virus. The large number of cases in which no indication of infection by either virus was obtained is striking, particularly since these cases were indistinguishable clinically from those in which no difficulty was encountered in establishing an etiological diagnosis and occurred simultaneously with them in each of the outbreaks.

DISCUSSION

The results of these studies covering a number of epidemics of influenza suggest that the etiology of this clinical syndrome is more diverse than had been realized previously. It seems evident, contrary to what might be expected, that more than one etiological variety of influenza may and often does occur in a single outbreak. The results of the serological studies which were carried out indicate clearly that while some cases in one epidemic were infected by influenza A virus but not by influenza B virus, other cases in the same epidemic were infected by influenza B virus but not by influenza A virus. The fact that in a few cases a specific antibody response to both viruses was demonstrated suggests that in these instances simultaneous or almost simultaneous infection by both agents occurred. The studies of throat washings from selected cases in the various epidemics serve to confirm the results of serological tests on the same cases. Ferrets or hamsters which responded to inoculation by the production of antibodies against influenza A virus or influenza B virus received in every instance throat washings from cases in which an antibody response against the homologous virus had been demonstrated. In no instance was the inoculation of a throat washing in ferrets or hamsters found to have stimulated the production of antibodies against both viruses.

Although evidence was obtained that a large proportion of all the cases studied in these epidemics were infected either by influenza A

virus or by influenza B virus, there remained in each epidemic an appreciable number of cases in which no evidence of infection by these agents could be demonstrated. It seems unreasonable to disregard these cases simply because a direct demonstration of a causal agent was not obtained. The fact that cases of this nature represented more than 30 percent of all the cases studied indicates that they were by no means of infrequent occurrence. Furthermore, since it was not possible to distinguish on clinical grounds between cases in this category and those in which evidence of infection by either influenza A or B virus was demonstrable, it appears obvious that the former cases should be considered to be examples of the clinical syndrome termed influenza with as much reason as the latter. This is particularly true since both varieties of cases occurred simultaneously in the same outbreaks. Since in these cases no increase in antibodies against either of the two known influenza viruses was demonstrable during convalescence, it seems logical to consider that infection by these agents had not occurred. The fact that throat washings from these cases, when inoculated into ferrets or hamsters, did not stimulate the production of antibodies against either virus may be taken as additional evidence that neither of these agents was associated with the disease.

On the basis of the completely negative laboratory data obtained in this series of cases, it seems logical to advance the hypothesis that there exists at least one additional infectious agent antigenically distinct from either influenza A virus or influenza B virus, which is capable of causing cases of influenza during epidemics of this disease. This hypothesis may be supported by the fact that throat washings from certain cases sometimes produced in ferrets fever and signs of respiratory infection similar to those caused by influenza A virus. Efforts to identify this hypothetical agent or to establish an etiological relationship to the human disease by means of neutralization tests in ferrets have been inconclusive so far. Furthermore, attempts to establish the agent in mice have not yet been successful.

If the available evidence does suggest the possibility that there is at least a third infectious agent capable of causing cases of influenza, it then becomes apparent that in some epidemics of the disease any one of at least three distinct causal agents may have been responsible for a certain proportion of the cases studied. In four of the outbreaks investigated during the past year there were some cases of influenza A, some of influenza B, and still others of a third variety which at the present time can only be termed influenza of unknown cause.

Under these circumstances it becomes exceedingly difficult to make any accurate assessment of the most common cause of cases in a particular epidemic of influenza unless a large number of cases is

studied by appropriate laboratory tests. The finding that some cases in a given epidemic have resulted from infection by influenza A virus does not now seem adequate evidence for the conclusion that the whole or even a major proportion of the epidemic was caused by this agent.

This difficulty is probably even more prominent in the study of a number of institutional outbreaks in a single epidemic since the somewhat abnormal conditions of confinement with consequent crowding may lead to increased contacts between inmates and therefore result in unusual exposure to infected individuals. As has been shown there were very marked differences in the proportion of cases studied which were caused by one or another of the two known viruses in two institutions in the same city during a single epidemic. How much of this variation in the etiology of the two outbreaks was apparent and due to chance sampling and how much was real, it is impossible to state. However, in the case of the seven institutional outbreaks in Alabama in which more than 67 percent of all clinical cases were studied there can be but little doubt that considerable variations in the proportions of influenza A and influenza of unknown cause actually occurred.

Whatever the coincidence of circumstances which initiate an epidemic of influenza, it seems likely that a number of variables influence its course and the distribution of the etiological agents responsible. If influenza A virus and influenza B virus are present and both produce cases at the same time, as apparently is not infrequently true, the number of cases due to either virus should be a function of the number of persons susceptible to infection by it and their chances of contact with it. Similar considerations should also be applicable to the hypothetical agent or agents responsible for cases of influenza of unknown cause.

SUMMARY

Studies of sera and throat washings obtained from numerous cases of influenza which occurred during three epidemic periods in 1 year have been carried out. In each epidemic period evidence was obtained that some cases were infected by influenza A virus and others by influenza B virus. In a considerable proportion of cases no evidence of infection by either virus was demonstrable. It is suggested that these cases resulted from infection by an agent or agents as yet unknown but distinct from either influenza A virus or influenza B virus. Since even in single institutional outbreaks cases of influenza A, influenza B, and influenza of unknown cause sometimes occurred simultaneously, it is suggested that epidemics of influenza may not infrequently be of diverse etiology.

REFERENCES

(1) Smith, W., Andrewes, C. H., and Laidlaw, P. P.: Lancet, 2: 66 (1933).
(2) Horsfall, F. L., Jr., Lennette, E. H., Rickard, E. R., Andrewes, C. H., Smith, W., and Stuart-Harris, C. H.: Lancet, 2: 413 (1940).
(3) Francis, T., Jr.: Am. J. Pub. Health, 27: 211 (1937).
(4) Stuart-Harris, C. H., Smith, W., and Andrewes, C. H.: Lancet, 1: 205 (1940).
(5) Rickard, E. R., Lennette, E. H., and Horsfall, F. L., Jr.: Pub. Health Rep., 55: 2146 (1940).
(6) Magill, T. P.: Proc. Soc. Exp. Biol. and Med., 45: 162 (1940).
(7) Francis, T., Jr.: Science, 92: 405 (1940).
(8) Francis, T., Jr.: Proc. Soc. Exp. Biol. and Med., 45: 861 (1940).
(9) Magill, T. P., and Tyndall, M.: Proc. Soc. Exp. Biol. and Med., 46: 371 (1941).
(10) Francis, T., Jr.: Science, 80: 457 (1934).
(11) Horsfall, F. L., Jr.: J. Exp. Med., 70: 209 (1939).
(12) Horsfall, F. L., Jr.: J. Bact., 40: 559 (1940).
(13) Horsfall, F. L., Jr., Hahn, R. G., and Rickard, E. R.: J. Clin. Invest., 19: 379 (1940).
(14) Reed, L. J., and Muench, H.: Am. J. Hyg., 27: 493 (1938).
(15) Horsfall, F. L., Jr., and Lennette, E. H.: J. Exp. Med., 73: 327 (1941).
(16) Horsfall, F. L., Jr., and Bauer, J. H.: J. Bact., 40: 569 (1940).
(17) Horsfall, F. L., Jr., Lennette, E. H., and Rickard, E. R.: J. Exp. Med., 73: 335 (1941).

A NEW INDUSTRIAL SKIN CLEANSER

By Louis Schwartz, *Medical Director, United States Public Health Service*

Harsh skin cleansers have frequently been found to be the actual causes of occupational dermatitis which before investigation seemed to have been caused by the chemicals manufactured or handled. Those workers who handle chemicals which are difficult to remove from the skin by ordinary toilet soaps are the ones mostly affected by dermatitis caused by skin cleansers. Synthetic dye workers, printers, dyers, workers with coal tar, pitch, asphalt, creosote oil, petroleum oils, greases, and soot are apt to use, for cleansing their hands after work, strongly alkaline and abrasive soaps which abrade and dissolve the superficial epithelium of the skin, volatile solvents which defat the skin, and powerful bleaching agents which cause chemical changes in the epithelium by chlorination and oxidation.

The damage to the skin caused by such harsh cleansers not only renders the skin more vulnerable to the action of irritant chemicals, but in many cases is the sole cause of occupational dermatitis.

Sulfonated oils, especially sulfonated vegetable oils, such as turkey red oil (an emulsion of a type of partially sulfonated castor oil and neutral soap), have long been used in industry. Recently, sulfonated vegetable oils have been used in the treatment of dermatitis.[1] Sulfonation of vegetable and mineral oils makes them emulsifying agents and they emulsify dirt and grease on the skin and help to cleanse it. Being miscible with water they can be used as skin cleansers and are

[1] Lane, C. Guy, and Blank, Irvin H.: Sulfonated oil as a detergent for diseases of the skin. Arch. Derm. and Syph., 43: 435 (March 1941).

of especial value in that the sulfonated vegetable oils do not defat the skin.

Sulfonated oils are made by mixing the oil in lead-lined vessels with 25–50 percent by weight of cold concentrated sulfuric acid, maintaining a temperature below 95° F. by slowly adding the acid. The oil is washed free from acid with sodium sulfate solution and then neutralized by the addition of an alkali, such as caustic soda or ammonia.

The degree of sulfonation and the method of neutralization influence the pH of the oil and the amount of SO_3 it contains, and determine its value as an industrial detergent and its suitability as a nonirritating, nondefatting skin cleanser.

A sulfonated vegetable or animal oil to be suitable for skin cleansing purposes should have a pH approximating that of the skin, but free from SO_3, have a fairly high fat content (about 50 percent), and be completely miscible with cold water.

Castor oil, coconut oil, olive oil, cottonseed oil, and other vegetable oils can all be sulfonated and made into useful skin cleansing compounds.

Petroleum oils can also be sulfonated, but they are not so good for the purpose of cleansing defatted or inflamed skins as are the sulfonated vegetable oils, because sulfonated petroleum oils themselves are fat solvents and the mineral oil contained in them does not replace the fatty matter lost by the skin. The mixing of sulfonated petroleum oils with sulfonated vegetable oils may increase their cleansing properties, but lessens their value as cleansers for dry, defatted skins.

The skin cleansing properties of the synthetic wetting agents, such as the fatty alcohol sulfates, have been known to dermatologists and cosmeticians for many years.[2] They work well even with hard waters and when mixed with soap or other foaming agents make excellent shampoos. These wetting agents, while superior to soap as pure cleansing agents, do defat the skin and may act as sensitizers. They are valuable in the treatment of certain diseases of the skin in which there is an excess of sebaceous or oily material in the skin. They can be manufactured so that their solutions have a wide latitude in hydrogen ion concentration and therefore can be used as "acid soaps" in cases of alkali sensitivity where ordinary alkali soaps are not tolerated.[3]

We have found that the defatting action of the wetting agents can be counteracted by mixing them with sulfonated animal or vegetable oils. We have made mixtures consisting of sulfonated castor oil having a pH of 7.2 and an oil content of 50 percent, with 2 percent of one of the wetting agents, Santomerse, Duponol, and Igepon, and

[2] Tersus, the proprietary name of a wetting agent first made in Germany, has been used for many years for the treatment of skin diseases and as a soap substitute.

[3] Duemling, Werner W.: Wetting agents. Arch. Derm. and Syph., 43: 264–278 (February 1941).

have found that it makes a good cleanser and does not defat the skin. [4]

The mixture is used in the same way as liquid soap, which it resembles in appearance, viz, a dram or two is put in the palm and rubbed into the skin and then washed off with water. The cleansing powers of this mixture can be increased without materially increasing its irritant properties by adding an alkali to it, such as trisodium phosphate 1–2 percent, or sodium hexameta phosphate in the same proportion. However, if the alkali is in excess it imparts a "sting" to the mixture, especially if it gets into cracks or abrasions of the skin.

This formula was first recommended by us to a large oil refining company for cleansing the hands of oil field workers whose skin had become inflamed from previously using kerosene to remove dirt and grease. These workers have used it sucessfully for over a year.

After a trial, this cleanser has also been installed in the wash rooms of a large plate printing establishment, where dermatitis (caused by strong cleansers used to remove dyes from the hands) has been constantly present for many years and where the use of this product has resulted in marked diminution of the number of new cases and a cure of most of the old ones.

In our skin clinic we have been prescribing this cleanser for several months for those cases of eczema and defatted skins in which soap and water are contraindicated and in which we have previously advised the use of olive oil as a cleanser. The results have been satisfactory in all cases. We have also had success with it in the treatment of atopic eczema in young children, several cases of which cleared up when the cleanser was used and recurred when soap was resumed.

When used as a skin cleanser in eczema, we do not advise the addition of alkali to the mixture because of its "stinging" properties.

When used as a skin cleanser in industrial establishments, workers who have had no dermatitis may object to the odor of the oil or complain that it does not foam as does soap, and some may state that they do not have to use it since their skins are not affected either by the chemicals which they handle or by the cleansers which they use. Therefore, it is suggested that a mild perfume such as lavender or lilac be added in sufficient quantity to hide the odor, and that, in those industrial establishments where dermatitis may occur from harsh cleansers used by the workers to remove extraneous matter from the hands, there should be installed in the wash rooms one or two outlets where this mixture of sulfonated castor oil and wetting agent is avaliable for the use of workers who are affected with dermatitis or with defatted skins. In this way workers whose skins are not affected by ordinary cleansers have their choice of using this mixture or other ordinary cleansers.

[4] There are many other wetting agents which may also be satisfactory. The following is a partial list of their trade names. Duponol, Gardinol, Alkanol, Merpol, Avirol, Nekal, Naccanol, Aerosol, Decerosol, Santomerse, Igepon, Triton, Orthopol, and Tergitol.

DISABLING SICKNESS AMONG 2,000 WHITE MALE GLASS WORKERS [1]

By WILLIAM M. GAFAFER, *Senior Statistician, United States Public Health Service*

INTRODUCTION

This is the tenth of a series of reports (*1–9*) from the Occupational Morbidity and Mortality Study, a study based principally on data transcribed from the membership records of industrial sick benefit organizations. The present report dealing with glass workers presents an analysis of absences lasting 8 days or longer that were accounted for by sickness and nonindustrial injuries, all of these absences beginning at some time during the 5 years, 1930–34.

The basic data are conveniently summarized in the following table:

Sex	Number of persons	Number of months of membership	Number of absences	Number of calendar days of disability	Number of deaths
Total	2,316	93,480	665	47,796	45
	White				
Male	2,169	88,125	597	42,432	36
Female	50	1,678	12	563	
	Negro				
Male	79	3,118	48	4,109	8
Female	2	120	2	24	
	Other				
Male	3	57	1	29	
Female	1	18	1	56	
	Unknown				
Male	12	364	4	578	1

For statistical purposes the group of white males is the one of choice, comprising as it does 94 percent of all members and accounting for an equal percentage of the total months of membership. The analyses, therefore, will be devoted exclusively to the experience of the white males.

Not all of the 2,169 white males selected for study were members of the sick benefit organizations for the entire period of 5 years. In fact, as is shown in the accompanying table, about one-third of the

[1] From the Division of Industrial Hygiene, National Institute of Health. References *10, 11,* and *12* contain informative material on the glass industry.

group belonged to an organization for 30 months or less, while about one-half of the group belonged for 55 or more months. It will be observed further that 999 were members for the entire 5 years.

Number and percent of workers	Number of months of membership in sick benefit organizations											
	Total	1–6	7–12	13–18	19–24	25–30	31–36	37–42	43–48	49–54	55–60	60
Number	2,169	289	161	112	87	81	89	89	96	102	1,063	999
Percent	100 0	13.3	7.4	5 2	4.0	3.8	4.1	4.1	4.4	4.7	49 0	46 0

For white males of all ages the average daily percentage disabled was 1.6. This percentage varied from 0.5 for persons under 25 years of age to 5.2 for those 65 years and over.

The requisite data on the degree, continuity, and length of the workers' exposure to specific environmental conditions, and materials for the determination of possible causes of differences among the morbidity rates are not available.[2]

The sick benefit organizations.—In the previous reports of the series reference was made to the fact that the regulations governing the payment of sick benefits influence the morbidity rates which are derived from the records of sick benefit organizations. As a rule these records do not deal with all disabilities which occur among the members nor with the total durations of all of the disabilities which are in the records.

The organizations under consideration operated under a group insurance plan. An applicant for membership must have one or more dependents and must have been an employee of the company for one year or more. Chronic ailments did not bar applicants from membership. A 7-day waiting period was in effect, meaning that 7 days must have elapsed between the onset of disability and the beginning of the payment of benefits. Illnesses, therefore, of less than 8 days' duration are not in the records. Benefits were paid for one illness of 26 weeks; when the disability continued beyond this maximum benefit period the insurance was cancelled. Upon his return to work the employee's insurance was again in force, the maximum benefit period being 52 weeks in any one year. The maximum benefit period introduces an understatement of the actual number of days lost per person per year, and the actual number of days per illness; these understatements are brought about by those disabilities extending beyond the termination of benefit payments. Finally, with respect to diagnosis a physician's certificate was required by the organizations before the payment of benefits was begun.

Grouping of occupations.—The wide variety of occupations, many of them with a relatively small number of person-years of membership, necessitated for purposes of analysis a grouping of the occupations into 8 groups as indicated in table 1. Similarity of work and of working environment were the bases of classification.

[2] In this connection the reader is referred to an editorial (*14*), and to pages 117-126 of reference *15*.

TABLE 1.—*Specific occupations comprising each occupational group, white male employees in the glass industry, 1930–34, inclusive*

[Total person-years of membership: 7,343.8]

Occupational group	Specific occupation
Millwrights, repair and construction workers (1,003.4 person-years).	Apprentice, battery man, blacksmith, blacksmith's helper, bricklayer, bricklayer's helper, carpenter, carpenter's helper, electric welder, engineer, machinist's helper, millwright, millwright's helper, nailer, oiler, painter, pipefitter, pipefitter's helper, plasterer, pumpman, repairman, repairman's helper, roof repairman, sheet metal worker, structure worker, tinner, truck repair helper, welder.
Cutters and examiners (984.7 person-years).	Cutters, examiners, re-examination classifiers.
Packers and shippers (868.9 person-years).	Carrier, crane follower, laborer, loader, packer, paper cutter machine man, pin maker, rack man, stockman, stower, truck operator, truck operator's helper.
Finishers (678.4 person-years).	Car man, mixer, roll tender, rouge tender, stripper.
Grinders (658.5 person-years).	Finisher, layer.
Batch mixers, furnace and casting workers (601.7 person-years).	Ash handler, batch mixer, boiler fireman, coal wheeler, crane operator, cullet washer, laboratory man and caster, lehr tender, miscellaneous worker, mixer, pot maker, weigher.
Outside workers (489.5 person-years).	Brakeman, deck hand, engineer, fireman, helper, hostler, laborer, shovel operator, switchman, truck driver, truckman.
All others (2,058.7 person-years).	Apprentice, assistant superintendent, attendant, barber, booker, cafeteria helper, cleaner, clean-up, clerk, conductor, craneman, electrician, electrician's helper, engineer, farm boss, feeder, foreman, gas maker, glass cleaner ground keeper and gardener, janitor, laborer, machine operator, machinist motorman, patrolman, pot shell picker, stop maker, substation operator' tool and die maker, tool room attendant, traffic manager, tuile house boss watcher, watchman, water tender, window cleaner, unknown.

ANALYSIS OF THE DATA

Age composition of the occupational groups.—Table 2 shows the percentage age distribution of the person-years of membership in the sick benefit organizations for specific occupational groups. For purposes of comparison there has been added the percentage age distribution of all gainful white male workers in the United States. When the two distributions are compared it will be observed that the sample under study is represented by relatively fewer persons 55 years and over, and about the same proportion of persons under 35 years of age. Both distributions show approximately the same percentage of persons in the age group 35 years and over.

TABLE 2.—*Percentage distribution of person-years of membership by age, according to occupational group, white male employees in the glass industry, 1930–34, inclusive*

Occupational group[1]	All known ages (100 percent)	Age in years as of July 1, 1932					
		Under 25	25–34	35–44	45–54	55–64	65 and over
All gainful white male workers in the United States[2]	*33,766,933*	*19.7*	*24.0*	*22.9*	*17.4*	*10.7*	*5.3*
All occupations, present study	7,317.3	11.7	31.9	25.0	20.6	8.7	2.1
Millwrights, repair and construction workers	992.7	5.7	27.6	30.6	25.7	8.7	1.7
Cutters and examiners	984.7	22.9	45.9	19.7	7.2	3.4	.9
Packers and shippers	858.9	8.1	26.8	26.1	30.4	7.4	1.2
Finishers	678.4	19.4	34.7	22.1	18.3	4.3	1.2
Grinders	653.8	16.7	32.6	19.3	20.9	8.2	2.3
Batch mixers, furnace and casting workers	601.7	7.8	25.2	30.7	22.1	13.1	1.1
Outside workers	488.5	4.6	29.2	17.5	26.9	19.9	1.9
All others	2,058.6	9.3	30.9	27.1	19.4	9.3	4.0

[2] Reference (13).

With regard to the percentage age distributions of particular occupational groups it will be noted that cutters and examiners under 35 years of age yield a percentage of 68.8 as compared with 43.6 for all occupations. The other occupational groups filled by younger men are finishers and grinders. Persons in the two occupational groups, batch mixers, furnace and casting workers, and outside workers, appear to be relatively older with 14.2 and 21.8 percent, respectively, in the age group 55 years and over.

Indexes of morbidity by age and diagnosis groups.—Table 3 presents the frequency, disability, and severity rates specific for age group and broad diagnosis group. The table shows a total frequency (age-standardized) of 82.8 absences per 1,000 workers, the nonrespiratory-nondigestive group of diseases, with a frequency of 35.4 contributing the largest number of absences; the next highest frequency, that for the respiratory group, is about one-third less, or 24.0. The frequencies for the remaining groups, nonindustrial injuries and digestive diseases, are approximately the same, 12.3 and 10.7, respectively. So far as frequency of absence because of illness is concerned the experience of the glass workers compares favorably with that of a group of approximately 170,000 male industrial workers. Reports to the United States Public Health Service on this group of workers yielded frequencies for 1930–34 as follows, the corresponding data for the glass workers being in parentheses: All diagnoses 89.3 (82.8), nonindustrial injuries 12.2 (12.3), respiratory diseases 31.5 (24.0), digestive diseases 13.2 (10.7), and nonrespiratory-nondigestive diseases 32.4 (35.4). It will be observed that the difference between the total frequencies reflects largely the behavior of the respiratory group.

The average annual number of days lost per person from all disabilities is 6.11. Again the largest contributor is the nonrespiratory-nondigestive group which accounts for about one-half of the total disability rate. Respiratory diseases, on the other hand, yielded 1.4 days, and digestive diseases and nonindustrial injuries 0.94 and 0.66, respectively.

The severity rate, average number of days per absence, presents less variability than either of the other two indexes. The rate for all diagnoses is 73.8 days per absence. The rates for digestive diseases and nonrespiratory-nondigestive diseases approximate each other with 88.2 and 87.1, respectively. Similarly, the remaining groups, respiratory diseases and nonindustrial injuries, approximate each other with 58.1 and 53.9, respectively. Thus while the group of digestive diseases yields the lowest frequency (10.7) of all four groups of diagnoses, this particular group of diseases accounts, on the average, for absences of longest duration (88.2 days).

TABLE 3.—*Indexes of morbidity for different age groups according to broad cause group, white male employees in the glass industry, 1930–34, inclusive*

Diagnosis group	All ages [1]		Age in years as of July 1, 1932					
	Standardized [2]	Crude	Under 25	25–34	35–44	45–54	55–64	65 and over
	Annual number of absences per 1,000 males [3]							
Total, all diagnoses [4]	82.8	81.3	46.9	68.5	93.6	82.7	113.6	172.9
Nonindustrial injuries	12.3	12.4	12.9	12.8	15.3	8.6	6.3	19.2
Respiratory diseases	24.0	24.1	10.6	24.0	27.4	19.9	41.0	38.4
Digestive diseases	10.7	10 9	7.0	11.6	10.4	13 2	7.9	19.2
Nonrespiratory-nondigestive diseases	35.4	33.5	16.4	19.7	40.0	41.0	56.8	96.1
	Annual number of days of disability per male							
Total, all diagnoses [4]	6.11	5.78	1.87	4.38	6.70	5.45	11.22	19.07
Nonindustrial injuries	.66	.67	.29	.72	.81	.50	.67	1.69
Respiratory diseases	1.39	1.34	.29	1.16	1.65	.94	2.93	3.84
Digestive diseases	.94	.94	.43	1.01	.95	.98	.93	2.43
Nonrespiratory-nondigestive diseases	3.08	2.79	.87	1.40	3.27	3.03	6.64	11.11
	Average number of days per absence [5]							
Total, all diagnoses [4]	73.8	71.1	40.0	63.9	71.6	65.9	98.8	110.3
Nonindustrial injuries	53.9	53.8	22.2	55.9	52.9	58.5	105.5	88.0
Respiratory diseases	58.1	55.7	27.0	48.6	60.2	47.4	71.5	100.0
Digestive diseases	88.2	86.4	61.8	87.3	91.2	74.2	118.2	126.3
Nonrespiratory-nondigestive diseases	87.1	83.4	52.9	71.3	81.9	73.8	116.9	115.7
	Number of 8-day or longer absences which began during 1930–34, inclusive							
Total, all diagnoses [4]	597		40	160	171	125	72	27
Nonindustrial injuries	91		11	30	28	13	4	3
Respiratory diseases	177		9	56	50	30	26	6
Digestive diseases	80		6	27	19	20	5	3
Nonrespiratory-nondigestive diseases	246		14	46	73	62	36	15
	Number of calendar days of disability							
Total, all diagnoses [4]	42,432		1,598	10,218	12,241	8,240	7,111	2,978
Nonindustrial injuries	4,893		244	1,676	1,481	760	422	284
Respiratory diseases	9,851		243	2,719	3,009	1,421	1,859	600
Digestive diseases	6,912		371	2,356	1,732	1,483	591	379
Nonrespiratory-nondigestive diseases	20,512		740	3,278	5,976	4,576	4,207	1,735
	Number of deaths							
Total, all diagnoses	36		1	5	2	12	10	6
Number of person-years of membership	7,343.8		853.6	2,335.3	1,826.8	1,511.7	633.7	156.2

[1] Includes a negligible number of persons of unknown age.
[2] Age-standardized according to the total gainfully employed white male workers in the United States (*13*, p. 117).
[3] Absences include only those which began during the study period, but days of disability include days for absences which began prior to, as well as during, the study period. This seeming excess of days of disability is compensated in part by the fact that days subsequent to 1934 are not included, even though some absences had not ended or reached 189 days at the close of the study period.
[4] Includes a negligible number of cases of ill-defined or unknown diagnosis.
[5] Includes all days of disability during the study period, regardless of when the disability began. Disabilities which reached 189 days were arbitrarily terminated at 189 days by the regulations of the sick benefit organizations.

Of considerable interest are the changes in the indexes with age. In general each index shows an increase for each cause group in passing from the youngest age group to the oldest. Thus for all diagnoses the frequency increases from 46.9 to 172.9, the disability rate from 1.87 days per worker to 19.07, and the severity rate from 40.0 days per absence to 110.3. Attention is also directed to the fact that for each index the movement of the nonrespiratory-nondigestive group of diseases approximately parallels that of all diagnoses; when the rates are presented graphically the curves show with respect to each index that the same cause group (nonrespiratory-nondigestive diseases) lies closest to the curve of all diagnoses. Thus the non-respiratory-nondigestive group is an important determining factor in the behavior of the three indexes representing all diagnoses.

Rheumatic diseases.[3]—While the magnitude of the available data precludes a statistical analysis by specific cause, the findings in connection with the rheumatic group of diseases are of no little interest. An examination of the number of days of disability according to cause reveals that of the total of 42,432 days for the 5 years, 6,596, or 15.5 percent, were accounted for by the rheumatic diseases. Moreover, this group of diseases was responsible for 76 of the grand total of 597 cases, or 12.7 percent. These findings are of considerable interest when compared with certain unpublished material in the Division of Industrial Hygiene. This material, based on over 200,000 male-years of exposure, yielded cases of rheumatic diseases which accounted for 10.3 percent of the total days of disability and 9.3 percent of the total number of cases experienced. While the number of cases of rheumatic diseases in the present experience is lower than that recorded for influenza and grippe (96), and for non-industrial injuries (91), the number of days disabled because of the rheumatic diseases ranks first with a total over 50 percent in excess of the days accounted for by influenza and grippe (4,007).

Morbidity by broad diagnosis group and occupation.—Table 4 presents the material with the specific occupational groups arranged in order of decreasing magnitude of person-years of membership. An examination of the occupationally specific rates covering all causes reveals three occupational groups of particular interest. These three groups, comprising grinders, outside workers, and finishers, have the highest frequency of absences as well as the largest number of days lost and absences of longest average duration. Thus these 3 groups have not only a relatively large number of disabilities each year but the disabilities are on the average more severe than those for the entire group of workers. It is of interest to observe that the outside workers show all three indexes to be relatively high for either the respiratory or the nonrespiratory diseases. Finishers, on the other hand, show indexes

[3] This group includes acute and chronic rheumatism, lumbago, neuritis, and sciatica.

below the average for the entire group of workers with respect to the respiratory diseases but above the average for the nonrespiratory diseases. Grinders yield indexes above the average with respect to nonrespiratory diseases, and while this occupational group experienced a low frequency of respiratory diseases the disability and severity rates were above the average for the entire group of workers. Attention is also directed to the group, millwrights, repair and construction workers, which shows for the respiratory diseases all three indexes above the average. Finally, the occupational group, batch mixers, furnace and casting workers, shows a relatively low frequency of respiratory diseases but a long average duration of cases.

TABLE 4.—*Indexes of morbidity for different broad cause groups according to occupational group, white male employees in the glass industry, 1930–34, inclusive*

Occupational group [1]	Annual number of absences per 1,000 males		Annual number of days of disability per male		Average number of days per absence		Number of 8-day or longer absences	Number of calendar days of disability	Number of person-years of membership
	Standardized [2]	Crude	Standardized [2]	Crude	Standardized [2]	Crude			
	All sickness and nonindustrial injuries								
All occupations	82.8	81.3	6.11	5.78	73.8	71.1	597	42,432	7,343.8
Millwrights, repair and construction workers	86.2	87.7	5.26	5.22	61.0	59.5	88	5,237	1,003.4
Cutters and examiners	78.2	68.0	5.61	4.31	71.7	63.4	67	4,247	984.7
Packers and shippers	89.3	88.6	6.34	6.01	71.0	67.8	77	5,218	868.9
Finishers	93.6	85.5	7.46	6.19	79.7	72.4	58	4,201	678.4
Grinders	103.7	98.7	8.48	7.67	81.7	77.7	65	5,048	658.5
Batch mixers, furnace and casting workers	65.0	66.5	4.37	4.42	67.2	66.6	40	2,662	601.7
Outside workers	101.5	106.2	9.96	10.75	98.2	101.2	52	5,264	489.5
All others	71.5	72.9	5.05	5.13	70.6	70.4	150	10,555	2,058.7
	Respiratory diseases								
All occupations	24.0	24.1	1.39	1.34	58.1	55.7	177	9,851	7,343.8
Millwrights, repair and construction workers	27.8	28.9	1.76	1.77	63.2	61.1	29	1,773	1,003.4
Cutters and examiners	20.0	18.3	1.08	.49	54.1	26.6	18	479	984.7
Packers and shippers	24.2	24.2	1.20	1.13	49.4	46.6	21	978	868.9
Finishers	22.2	20.6	1.04	.87	46.7	42.0	14	588	678.4
Grinders	23.5	22.8	1.64	1.49	69.8	65.6	15	984	658.5
Batch mixers, furnace and casting workers	17.2	18.3	1.25	1.30	72.4	71.2	11	783	601.7
Outside workers	35.1	38.8	3.32	3.69	94.5	95.1	19	1,807	489.5
All others	23.3	24.3	1.15	1.19	49.5	49.2	50	2,459	2,058.7
	Nonrespiratory diseases								
All occupations	46.1	44.4	4.03	3.73	87.3	84.1	326	27,424	7,343.8
Millwrights, repair and construction workers	41.2	41.9	2.70	2.65	65.6	63.4	42	2,662	1,003.4
Cutters and examiners	45.9	36.6	4.26	3.08	92.9	84.2	36	3,030	984.7
Packers and shippers	50.6	50.6	4.45	4.20	88.0	82.9	44	3,647	868.9
Finishers	56.9	50.1	5.88	4.74	103.4	94.6	34	3,215	678.4
Grinders	56.9	53.2	5.64	5.03	99.1	94.6	35	3,310	658.5
Batch mixers, furnace and casting workers	40.8	41.5	2.89	2.90	70.9	69.7	25	1,742	601.7
Outside workers	63.8	67.4	5.90	6.37	92.4	94.4	33	3,116	489.5
All others	37.0	37.4	3.25	3.26	87.8	87.0	77	6,702	2,058.7

[1] See table 1.

[2] Age standardized according to the total gainfully employed white male workers in the United States (*13*, p. 117).

SUMMARY

This report deals with sickness and nonindustrial injuries causing disability lasting 8 calendar days or longer among approximately 2,000 white male workers in the glass industry during the 5 years, 1930–34.

The frequency of disability by broad diagnosis groups compares favorably with that experienced by 170,000 male industrial workers.

The number of days of disability because of the rheumatic diseases was over 50 percent greater than the number accounted for by influenza and grippe.

Grinders, outside workers, and finishers experienced frequency, disability, and severity rates well above the average for the entire group of workers.

REFERENCES

PAPERS FROM THE OCCUPATIONAL MORBIDITY AND MORTALITY STUDY

(*1*) Sayers, R. R., DallaValle, J. M., and Bloomfield, S. G.: Occupational and environmental analysis of the cement, clay, and pottery industries. Pub. Health Bull. No. 238. United States Government Printing Office, 1937.

(*2*) Sayers, R. R., Kroeger, Gertrud, and Gafafer, W. M.: General aspects and functions of the sick benefit organization. Pub. Health Rep., **52**: 1563–1580 (1937). (Reprint No. 1874.)

(*3*) Gafafer, W. M.: Frequency of sickness and nonindustrial accidents causing disability lasting eight calendar days or longer among 60,000 white male railroad employees, 1930–34, inclusive. Pub. Health Rep., **53**: 555–573 (1938). (Reprint No. 1924.)

(*4*) Brinton, H. P.: Disabling sickness and nonindustrial injuries among drivers and other employees of certain bus and cab companies, 1930–34, inclusive. Pub. Health Rep., **54**: 459–468 (1939). (Reprint No. 2049.)

(*5*) Brinton, H. P., and Seifert, H. E.: Disabling morbidity among employees in the soap industry, 1930–34, inclusive. Pub. Health Rep., **54**: 1301–1316 (1939). (Reprint No. 2093.)

(*6*) Seifert, H. E.: The coding of occupations for machine tabulating purposes with reference principally to studies on occupational morbidity. J. Ind. Hyg., **21**: 246–255 (1939).

(*7*) Brinton, H. P.: Disabling morbidity, and mortality among white and Negro male employees in the slaughter and meat packing industry, 1930–34, inclusive. Pub. Health Rep., **54**: 1965–1977 (1939). (Reprint No. 2111.)

(*8*) Brinton, H. P., Seifert, H. E., and Frasier, Elizabeth S.: Disabling morbidity among employees in the slaughter and meat packing industry, 1930–34, inclusive. Pub. Health Rep., **54**: 2196–2219 (1939). (Reprint No. 2119.)

(*9*) Brinton, H. P., and Frasier, Elizabeth S.: Disabling morbidity among male and female employees in mail-order stores, 1930–34, inclusive. Pub. Health Rep., **55**: 1163–1178 (1940).

OTHER REFERENCES

(*10*) Scholes, S. R.: Modern Glass Practice. Industrial Publications, Inc., Chicago, 1935.

(*10a*) Scholes, S. R.: Handbook of the Glass Industry. The Glass Industry, New York [1940].

(*11*) Marson, P., and Angus-Butterworth, L. M.: Glass and Glass Manufacture. Pitman and Sons, Ltd., London, 1936.

(*12*) West Virginia State Health Department, Bureau of Industrial Hygiene: A report on the glass industry in West Virginia. West Virginia State Health Department, Charleston. (Mimeographed, ca. 1938.)

(13) U. S. Department of Commerce, Bureau of the Census: Fifteenth Census of the United States. Population, vol. 5, General Report on Occupations, United States Government Printing Office, 1933. P. 117.
(14) Editorial: Occupation and mortality. Lancet, 1: 1174–1175 (May 21, 1938).
(15) Greenwood, M.: Epidemics and Crowd-Diseases, An Introduction to the Study of Epidemiology. Williams and Norgate, Ltd., London [1935.]

ORNITHODOROS TURICATA: THE MALE; FEEDING AND COPULATION HABITS, FERTILITY, SPAN OF LIFE, AND THE TRANSMISSION OF RELAPSING FEVER SPIROCHETES[1]

By Gordon E. Davis, *Bacteriologist, United States Public Health Service*

In 1937 a series of 12 *O. turicata* males that had been reared individually from the egg in shell vials was selected for observations concerning feeding, copulation, fertility, span of life, and the transmission of relapsing fever spirochetes. In the nymphal stages 8 of these ticks had been allowed to feed on rats infected with a Kansas strain of spirochetes, 2 on rats infected with a Texas strain of spirochetes, and 1 had acquired a Kansas strain through the egg.

Feeding habits.—When placed on an appropriate host at regular intervals and allowed to engorge completely, the male will feed every 3 or 4 weeks. It becomes as fully distended with blood as the female or any of the immature stages. The time required for engorgement, i. e., from the time of attachment to that of voluntary detachment, has been determined for 100 feedings. When the tick is completely engorged the integument has a shiny appearance and coxal fluid may be exuded on the host. Ticks which detached as the result of quick movements of the host and those which remained attached after complete engorgement were not considered. When the tick is detached before complete engorgement, no coxal fluid is exuded and if it remains attached after complete engorgement, there has been a deflation coincident to the exudation of the fluid.

Table 1 shows the time in minutes required for complete engorgement. Observations on individual ticks varied from 4 to 13, according to the opportunity available at the time of feeding. The shortest feeding period was 6 minutes and the longest 23 minutes. The rate of filling depends to some extent on the site of attachment.

Table 1.—*O. turicata males: Feeding time in minutes*

Time in minutes	6–10	10–15	16–20	20–23
Number of observations	18	62	16	4

[1] Contribution from the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

Copulation time (table 2).—Copulation time is considered as the period which elapses between attachment of the male to the female and the appearance of the spermatophore, with the consequent voluntary removal of the male from the mating position. Again there were 100 observations made and from 4 to 13 timings on individual ticks. The shortest period was 12 minutes and the longest 60 minutes.

TABLE 2.—*O. turicata males: Copulation time in minutes*

Time in minutes	12-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
Number of copulations	9	15	21	21	16	3	6	6	2	1

TABLE 3.—*A comparison of the fertility of virgin and "old" males when allowed to copulate with virgin females*

"OLD" MALES

♂ Tick No.	Following feeding	Copulation	Number eggs deposited	Number of larvae	Fertility percentage
5	23d	20th	309	233	
31	20th	16th	92	4	
8	17th	16th	86	20	
6	20th	18th	201	161	
6	21st	19th	121	59	
5	24th	21st	209	126	
31	21st	17th	244	198	
17K	18th	13th	257	207	
28	21st	19th	175	91	
8	18th	17th	237	226	
Total			1,931	1,325	68

VIRGIN MALES

♂ Tick No.	Following feeding	Copulation	Number eggs deposited	Number of larvae	Fertility percentage
42		None	252	112	
17		None	121	26	
16		None	213	121	
6		None	131	74	
25		None	169	130	
33		None	232	79	
48		None	42	42	
52		None	138	39	
22		None	257	196	
7		None	254	98	
37		None	81	54	
43		None	148	67	
4		None	116	63	
13		None	145	119	
Total			2,299	1,220	53

Fertility (table 3).—It might be assumed that the fertility of the older males is less than that of the younger ones. However, observations do not bear out this assumption. Following mating of 14 virgin males and females a total of 2,299 eggs were deposited, resulting in 1,220 larvae, or a fertility rate of 53 percent. Following the mating of 10 "old" males and virgin females a total of 1,931 eggs were deposited, resulting in 1,325 larvae, a fertility rate of 68 percent. Subsequent to this test, male No. 28, at its twenty-eighth mating, copulated with a virgin female, resulting in 111 eggs and 82 larvae, a fertility rate of 73.8 percent. At the twenty-ninth copulation this

male again mated with a virgin female. There was deposition of 173 eggs of which 164 hatched, a fertility rate of 95 percent.

Transmission of spirochetes.—The male, as well as the female and the immature forms, transmits relapsing fever spirochetes, although they are not necessarily transmitted at each feeding. In a total of 242 test feedings spirochetes were transmitted 180 times. Four ticks were successful in transmission at each feeding, viz, 7, 13, 20, and 23 times, respectively, and 7 were irregular. One tick (No. 6) transmitted spirochetes 7 times in the first 8 feedings, but failed in 21 additional test feedings.

Sexual transmission.—Six sexual transmission experiments were each initiated by allowing virgin females which had failed to transmit spirochetes in any of the nymphal stages to copulate with males which had been repeatedly successful in the transmission of spirochetes. Eleven males were used, 4 of which were carrying a Texas strain of spirochetes and 7 a Kansas strain.

A total of 22 test feedings of the 6 females, following a total of 22 matings with the above males, failed to infect white mice or young white rats. Progeny of these females were also tested as follows: 789 in the larval stage, 289 in the larval and first nymphal stages, and 151 in the larval and first and second nymphal stages. Spirochetes were not demonstrated in the blood of any of the test animals.

Longevity.—Length of life was determined on 11 males stored in humidity jars at a varying laboratory temperature. Under these conditions the span of life of the 11 was 15, 18, 22, 23, 26, 29, 30, 30, 34, 35, and 36 months. One tick (No. 28) remains alive after 36 months and feeds and mates normally. (See record under fertility.) Francis has recently reported the survival of male *turicata* for 6 years and 8 months.

Table 4 summarizes the span of adult life, the number of adult feedings, the number of spirochetal transmissions, and the number of copulations for each of the 11 ticks.

TABLE 4.—*O. turicata males; span of life, number of feedings, spirochete transmissions, and copulations*

Tick number	Infective feeding	First adult feeding	Span of adult life in months	Number of adult feedings	Number of transmissions	Number of copulations
36	Dec. 15, 1936	Sept. 17, 1937	[1] 12	7	7	5
28	Feb. 3, 1937	Aug. 31, 1937	36+	30	19	30
5	Dec. 15, 1936	July 6, 1937	28	27	22	23
17T	Feb. 3, 1937	Aug. 31, 1937	23	23	23	17
6	Dec. 15, 1936	July 6, 1937	35	29	7	23
7	Mar. 8, 1937	Aug. 26, 1937	22	20	20	21
17K	Dec. 15, 1936	Sept. 22, 1937	25	21	16	16
43	do	Oct. 8, 1937	18	12	9	10
21	do	July 6, 1937	18	12	8	13
31	Dec. 7, 1936	July 7, 1937	34	27	18	19
8	Dec. 15, 1936	Mar. 5, 1937	30	21	18	20
3	(2)	Oct. 15, 1937	15	13	13	13

[1] Lost in transportation.
[2] Transovarial transmission.

DISCUSSION

It is obvious that this study was made under artificial conditions. However, it does present a relative idea of several biological phases of the male *turicata*. The span of life as determined under laboratory conditions may be longer or shorter than under natural conditions. Temperature and humidity are two important factors, the natural conditions of which are not easily duplicated in the laboratory. In nature the surface temperature may be very high while a few inches beneath the surface the sandy burrows are cool and moist, as noted in southwestern Kansas and the sand dunes of northern Oklahoma. (In the laboratory all larvae under test have survived the molting period in a humidity jar (saturated ammonium chloride) at temperature of 80° F., thus indicating that in the early stages this species may survive a fairly high temperature.)

In the experimental work the males were used for mating at intervals of 3 to 4 days, but under natural conditions it is possible that they are able to copulate at more frequent intervals. That spirochetes may be transmitted more frequently than indicated by the records is suggested by the facts that transmission can be effected in less than 1 minute and that the male is at times rather easily dislodged and blood meals, therefore, are probably taken rather frequently.

SUMMARY

1. Twelve male *O. turicata* were observed for feeding and copulation habits, the transmission of relapsing fever spirochetes, span of life, and for fertility as "old" males in comparison with young males.

2. Based on 100 observations, time for complete engorgement varied from 6 to 23 minutes.

3. Based on 100 observations, the time required to complete the act of mating varied from 12 to 60 minutes, with the majority falling between 21 and 35 minutes.

4. The male may transmit spirochetes at each feeding throughout life; it may transmit them irregularly or, after several successive transmissions, it may fail to effect further transmissions.

5. A comparison of the fertility of virgin males and "old" males suggests that mating of the latter results in a larger proportion of fertile eggs.

6. Test feedings of 6 females (a total of 22 feedings) after each mating with spirochete-carrying males and 1,229 test feedings of the progeny of these matings failed to infect white mice.

7. The span of adult male life under laboratory conditions varied from 15 to over 36 months.

REFERENCE

Francis, Edward: Longevity of the tick *Ornithodoros turicata* and of *Spirochaeta recurrentis* within this tick. Pub. Health Rep., **53**: 2220–41 (1938).

TWO STRAINS OF ENDEMIC TYPHUS FEVER VIRUS ISOLATED FROM NATURALLY INFECTED CHICKEN FLEAS (*ECHIDNOPHAGA GALLINACEA*)[1]

By George D. Brigham, *Associate Bacteriologist, United States Public Health Service*

The virus of endemic typhus fever has been recovered in nature or transmitted experimentally in several species of fleas. However, no mention has been made of its recovery from the chicken flea (*Echidnophaga gallinacea*). We can now report the recovery of endemic typhus fever virus from naturally infected chicken fleas.

The first strain was isolated from a pool of 135 chicken fleas removed from two Norway rats trapped on a farm in Georgia in May 1939. The owner of the farm was sick at the time with a typical case of endemic typhus fever.[2] Additional strains of endemic typhus virus were recovered from the pooled brains of the two rats as well as from pools of 5 *X. cheopis* and 7 *L. segnis* fleas combed from these rats.

The strain isolated from chicken fleas was shown to be endemic typhus virus by passage through fourteen guinea pig generations, 53 guinea pigs being used; 42 of these animals developed clinical endemic typhus with scrotal reactions, 2 developed fever only; 7 showed no evidence of infection, although 5 of the 7 were found to be immune; 2 died of secondary infections. Cross-immunity with three known endemic typhus fever strains was demonstrated. Rickettsiae were found in smears from the tunica vaginalis of the passage guinea pigs. Senior Surgeon R. D. Lillie reported the brains of 5 passage guinea pigs positive for the characteristic typhus lesions. Two rabbits inoculated with this strain produced agglutinins for Proteus OX_{19}.

In September 1939 the City Health Officer of Albany, Ga., submitted for examination a rat[3] which had been shot coming out of a chicken yard in the residential section of the city. *Echidnophaga gallinacea* were the only fleas recovered from this rat. A strain of typhus was recovered from the brain and from a pool of 30 chicken fleas combed from the rodent.

We carried this flea strain through twelve generations of guinea pigs, 49 guinea pigs being used. Of the 49 animals, 39 produced clinical endemic typhus with scrotal reactions; 6 developed fever only; 2 showed no evidence of infection although they were found to

[1] From the Typhus Research Laboratory, Savannah, Ga., Division of Infectious Diseases, National Institute of Health.

[2] Acknowledgment is made to Dr. R. R. Holt, Parrott, Ga., and to Dr. C. A. Henderson, County Health Commissioner, Terrell County, Ga., for reporting the case to the Laboratory, and to Dr. James Watt, Passed Assistant Surgeon, U. S. Public Health Service, for assistance in trapping the rats.

[3] This rat was apparently a cross between the domestic white and the wild Norway species as the color pattern showed white flanks and abdomen with a definite Norway colored head and stripe extending down the back and including the tail. Several rats of this color pattern had been trapped in Albany from time to time.

be immune; 2 died of secondary infections. Cross-immunity was complete with four other strains of endemic typhus fever including the other chicken flea strain. Rickettsiae were demonstrated in smears from the tunica vaginalis. Senior Surgeon R. D. Lillie reported characteristic typhus lesions present in the brains of 6 passage guinea pigs. Agglutinins for Proteus OX_{19} were produced in two rabbits inoculated with this strain.

DEATHS DURING WEEK ENDED AUGUST 23, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 23, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,068	7,063
Average for 3 prior years	7,029	
Total deaths, first 34 weeks of year	292,073	282,741
Deaths per 1,000 population, first 34 weeks of year, annual rate	12.0	12.0
Deaths under 1 year of age	459	476
Average for 3 prior years	497	
Deaths under 1 year of age, first 34 weeks of year	17,845	17,102
Data from industrial insurance companies:		
Policies in force	64,428,243	64,973,192
Number of death claims	10,800	10,997
Death claims per 1,000 policies in force, annual rate	8.7	8.8
Death claims per 1,000 policies, first 34 weeks of year, annual rate	9.8	10.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED AUGUST 30, 1941

Summary

A total of 624 cases of poliomyelitis was reported during the current week as compared with 611 cases for the preceding week. The rate of increase was only 2 percent as compared with 11 percent for the preceding week, and with 30 percent for the next earlier week. A decreased incidence was shown generally in the southern area, while the most significant increases were recorded for the northern areas, especially the New England and North Central States.

The following named 13 States reported 15 or more cases during the current week (last week's figures in parentheses): New York 69 (66); Alabama 65 (78); Pennsylvania 65 (82); Georgia 50 (74); Ohio 36 (44); Maryland 32 (21); Illinois 31 (23); New Jersey 29 (25); Tennessee 29 (39); Massachusetts 21 (8); Minnesota 21 (14); Florida 16 (14); Kentucky 15 (25). A total of 4,025 cases has been reported this year to date (first 35 weeks) as compared with 4,695 for the corresponding period in 1937, in which year the incidence was the highest for this period during the 5 years, 1936–40.

For the second week the incidence of encephalitis has declined in the North Central States. Following are the numbers of cases reported currently (with last week's figures in parentheses): North Dakota 98 (120); South Dakota 13 (38); Minnesota 51 (95). Colorado reported 32 cases as compared with 20 for the preceding week. There has been a preponderance of cases among males in the rural population. Preliminary epidemiological data suggest a rapidly traveling mode of spread and widespread reservoir of infection. Cases of encephalomyelitis in horses are reported to occur principally in young, unvaccinated animals.

During the week plague infection was again reported found in fleas from ground squirrels in Siskiyou County, Calif.

Of 21 cases of Rocky Mountain spotted fever, only 2 cases were reported in the Rocky Mountain area; and of 70 cases of endemic typhus fever, 28 cases occurred in Georgia and 22 in Texas.

The death rate for the current week in 88 large cities in the United States was 9.9 per 1,000 population, the same as for the preceding week and the same as the 3-year (1938–40) average. The cumulative rate to date (first 35 weeks) is 11.9 as compared with 12.0 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended August 30, 1941, and comparison with corresponding week of 1949 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940	
NEW ENG.												
Maine	2	0	1	------	------	------	15	3	3	0	0	0
New Hampshire	0	0	0	------	------	------	0	0	0	0	0	0
Vermont	0	0	0	------	------	------	4	2	------	0	0	0
Massachusetts	1	1	3	------	------	------	38	52	27	1	0	0
Rhode Island	1	0	0	------	------	------	3	2	2	0	0	0
Connecticut	0	0	1	------	1	1	13	6	4	0	0	0
MID. ATL.												
New York	10	5	8	[1] 0	[1] 6	[1] 1	57	128	75	2	1	2
New Jersey [2]	3	1	1	3	------	------	20	27	20	0	1	1
Pennsylvania	7	4	12	1	------	------	69	39	47	2	1	4
E. NO. CEN.												
Ohio	3	1	13	8	1	1	24	8	13	1	0	1
Indiana [2]	8	5	5	3	4	4	5	1	3	1	1	1
Illinois [2]	10	5	13	2	6	6	9	22	11	1	2	2
Michigan [3]	6	1	6	------	------	------	9	55	27	2	1	1
Wisconsin	0	1	1	6	20	12	43	79	33	0	0	1
W. NO. CEN.												
Minnesota	2	2	2	------	2	2	1	1	6	0	0	0
Iowa [2]	2	17	5	1	------	------	4	15	4	0	2	1
Missouri [3]	6	1	7	1	------	9	6	2	2	0	2	1
North Dakota	0	4	2	------	1	1	6	0	2	0	0	0
South Dakota	9	0	0	------	------	------	3	0	0	0	1	1
Nebraska	0	0	1	------	------	------	2	3	2	0	0	0
Kansas	3	2	2	------	6	------	17	12	2	0	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	0	2	------	0	0	0
Maryland [2] [3]	1	1	3	2	2	2	16	3	4	1	1	1
Dist. of Col.	0	2	2	------	------	------	6	3	8	0	0	1
Virginia [2]	5	15	22	8	38	------	4	10	10	5	1	1
West Virginia [2] [3]	0	2	8	6	7	9	31	1	2	0	0	1
North Carolina [2]	32	4	44	------	------	------	12	2	19	1	0	2
South Carolina [4]	10	4	4	43	90	90	10	10	6	2	1	0
Georgia [4]	18	7	14	19	25	------	28	4	------	0	0	0
Florida [4]	1	3	3	6	3	1	4	0	1	0	0	0
E. SO. CEN.												
Kentucky	7	9	11	1	2	2	8	23	15	1	0	1
Tennessee	9	4	6	2	4	7	2	7	6	1	1	0
Alabama [4]	18	9	13	6	3	5	16	27	3	1	3	2
Mississippi [3]	11	12	13	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	7	6	14	2	3	4	14	4	3	0	0	0
Louisiana [4]	0	5	7	------	1	5	3	0	------	1	1	1
Oklahoma	7	5	6	6	5	8	2	1	3	0	0	0
Texas [3] [4]	18	22	28	265	108	67	35	29	18	1	3	2
MOUNTAIN												
Montana	2	5	1	------	------	------	3	9	9	0	0	0
Idaho	0	0	0	------	------	------	3	0	0	0	0	0
Wyoming [2]	0	0	0	4	------	------	0	0	0	0	0	0
Colorado	1	4	4	20	------	------	14	14	7	1	0	0
New Mexico	0	5	5	------	------	------	5	6	1	0	1	0
Arizona	1	0	0	30	30	13	10	7	4	0	0	0
Utah [2]	0	0	0	1	------	------	3	9	8	0	0	0
Nevada [2]	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	2	0	0	------	------	------	6	3	4	1	0	0
Oregon	1	1	1	4	5	4	16	9	5	1	0	0
California [4]	5	10	15	16	10	11	90	26	43	0	0	0
Total	229	185	362	486	383	339	689	666	633	27	24	26
35 weeks	8,075	9,231	14,417	600,897	169,989	152,280	832,204	230,037	270,969	1,467	1,211	2,214

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 30, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940		Aug. 30, 1941	Aug. 31, 1940	
NEW ENG.												
Maine	4	1	1	1	0	2	0	0	0	1	3	3
New Hampshire	2	0	0	0	2	0	0	0	0	1	0	0
Vermont	3	0	0	4	0	1	0	0	0	6	0	0
Massachusetts	21	2	3	52	10	18	0	0	0	3	7	4
Rhode Island	5	1	0	3	2	2	0	0	0	0	0	0
Connecticut	5	0	1	5	7	4	0	0	0	5	7	4
MID. ATL.												
New York	69	20	20	62	38	46	0	0	0	26	12	28
New Jersey [2]	29	4	4	21	19	16	0	0	0	4	4	6
Pennsylvania	65	13	13	32	42	59	0	0	0	23	10	24
E. NO. CEN												
Ohio	38	21	14	34	17	34	0	0	0	12	6	28
Indiana [2]	6	68	2	7	23	28	0	0	0	0	6	14
Illinois [2]	31	20	19	43	70	70	0	1	1	10	16	22
Michigan [3]	26	135	34	31	41	62	0	3	0	11	4	9
Wisconsin	3	19	7	24	30	42	0	0	0	4	1	1
W. NO. CEN.												
Minnesota	21	6	6	15	15	15	0	3	3	0	1	1
Iowa [2]	0	56	2	7	13	13	0	0	2	2	0	4
Missouri [2]	5	18	1	14	6	16	0	1	1	9	8	25
North Dakota	0	1	1	2	3	4	0	0	0	0	2	1
South Dakota	3	5	1	11	1	6	0	3	1	0	0	0
Nebraska	0	13	2	3	2	4	0	0	0	1	2	1
Kansas	3	43	3	29	19	23	0	0	0	4	7	7
SO. ATL.												
Delaware	0	0	0	3	0	0	0	0	0	0	1	1
Maryland [2 3]	32	1	1	9	5	11	0	0	0	6	6	9
Dist. of Col.	8	0	1	6	4	2	0	0	0	1	4	4
Virginia [2]	5	7	3	7	1	6	0	0	0	6	5	13
West Virginia [2 3]	4	41	2	21	11	12	0	0	0	7	6	12
North Carolina [2]	10	1	2	17	23	24	0	0	0	11	29	20
South Carolina [4]	• 8	1	1	3	8	3	0	0	0	9	8	10
Georgia [4]	[5] 50	3	2	5	3	10	0	0	0	32	23	18
Florida [4]	16	3	3	2	2	2	0	0	0	7	3	3
E. SO. CEN.												
Kentucky	15	10	7	17	17	29	0	0	0	20	16	33
Tennessee	29	4	3	8	10	10	0	0	0	20	15	13
Alabama [4]	65	4	4	11	20	17	0	0	0	6	14	14
Mississippi [2]	12	0	2	6	4	8	0	0	0	18	13	9
W. SO. CEN.												
Arkansas	3	1	1	8	4	4	0	0	0	9	33	19
Louisiana [4]	3	7	0	2	6	6	1	0	0	13	24	20
Oklahoma	2	3	2	3	8	8	0	1	0	14	15	16
Texas [3 4]	5	8	8	16	16	24	0	0	0	31	40	51
MOUNTAIN												
Montana	3	16	2	6	13	9	0	0	0	2	2	2
Idaho	1	1	1	5	3	3	0	0	0	0	0	2
Wyoming [2]	0	4	0	0	1	3	0	3	0	1	1	1
Colorado	0	3	2	11	7	7	0	0	0	0	5	4
New Mexico	0	2	1	0	0	1	0	0	0	0	4	7
Arizona	2	1	1	0	1	1	0	0	0	1	0	3
Utah [3]	3	3	1	2	2	7	0	0	0	1	1	1
Nevada [2]	0	------	------	0	------	------	0	------	------	1	------	------
PACIFIC												
Washington	0	20	1	8	9	9	0	0	0	3	7	3
Oregon	5	3	2	14	4	6	1	2	1	0	1	2
California [4]	6	13	13	27	39	54	0	0	0	7	7	12
Total	624	606	479	617	581	843	2	17	21	348	379	556
35 weeks	[5] 4,025	3,801	3,009	93,070	120,056	138,694	1,195	1,988	3,080	5,152	5,784	8,226

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended August 30, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended Aug. 30, 1941	Whooping cough, Week ended Aug. 31, 1940
NEW ENG.		
Maine	19	23
New Hampshire	8	0
Vermont	16	8
Massachusetts	110	72
Rhode Island	12	1
Connecticut	88	20
MID. ATL.		
New York	290	216
New Jersey [2]	88	74
Pennsylvania	192	309
E. NO. CEN.		
Ohio	257	144
Indiana [2]	17	19
Illinois [2]	201	91
Michigan [3]	305	200
Wisconsin	271	59
W. NO. CEN.		
Minnesota	35	8
Iowa [2]	40	23
Missouri [2]	0	8
North Dakota	13	7
South Dakota	2	6
Nebraska	3	3
Kansas	63	41
SO. ATL.		
Delaware	1	4
Maryland [2, 3]	56	76
Dist. of Col.	15	9
Virginia [2]	10	22
West Virginia [2, 3]	13	43
North Carolina [2]	122	93
South Carolina [4]	61	18
SO. ATL.—continued		
Georgia [4]	19	12
Florida [4]	23	0
E. SO. CEN.		
Kentucky	47	27
Tennessee	30	25
Alabama [4]	25	21
Mississippi [3]		
W. SO. CEN.		
Arkansas	13	5
Louisiana [4]	1	6
Oklahoma	11	8
Texas [3, 4]	136	142
MOUNTAIN		
Montana	32	6
Idaho	27	0
Wyoming [2]	35	2
Colorado	93	9
New Mexico	8	7
Arizona	7	14
Utah [3]	49	36
Nevada [3]	0	
PACIFIC		
Washington	65	23
Oregon	19	14
California [4]	194	215
Total	3,101	2,167
35 weeks	152,851	112,304

[1] New York City only.
[2] Rocky Mountain spotted fever, week ended Aug. 30, 1941, 21 cases, as follows: New Jersey, 1; Indiana, 1; Illinois, 5; Iowa, 2; Missouri, 2; Maryland, 2; Virginia, 2; West Virginia, 1; North Carolina, 3; Wyoming, 1; Nevada, 1.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended Aug. 30, 1941, 70 cases, as follows: Alabama, 8; California, 1; Florida, 3; Georgia, 28; Louisiana, 7; South Carolina, 1; Texas, 22. The 123 cases of endemic typhus fever reported in Lavaca County, Texas, for the week ended Aug. 16 (Public Health Reports, Aug. 22, 1941) occurred during the period July 6–Aug. 9. A field study has revealed an unusually large rat population in Lavaca and adjoining counties.
[5] Report on corrected diagnoses shows a total of 519 cases of poliomyelitis in Georgia up to Aug. 23 instead of 551, the total of the weekly reports.

CONSOLIDATED MONTHLY STATE REPORTS FOR APRIL, MAY, AND JUNE 1941

Division and State	Actinomycosis	Chickenpox	Diphtheria	Dysentery, amebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	German measles	Hookworm disease	Influenza	Malaria	Measles	Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
NEW ENG.																	
Maine		731	6		1			418		13		1,309	2	690			117
New Hampshire		50	1							4	1	529	2	197			5
Vermont		310	10					1,420				805	0	451			11
Massachusetts		3,628	86	2	17		5	1,697			3	12,058	32	4,085	(1)	3	[2] 807
Rhode Island		621	13					124		4		109	1	37			83
Connecticut		2,098	17	2				1,090		17	5	4,910	7	2,341	2		525
MID. ATL.																	
New York		9,002	154	13	188		16	21,050			14	56,706	64		[5] 29		6,241
New Jersey		5,391	61	1	1		2	22,241		112	2	28,605	16	4,231	16		993
Pennsylvania		10,014	163		4		6	8,119			5	62,541	47	12,453	2	2	1,597
E. NO. CEN.																	
Ohio		4,498	109	3			5	1,661		140	5	51,030	19	1,747		2	1,038
Indiana		823	111				4	716		121	2	11,028	6	452			205
Illinois	2	4,730	221	17	18		[3] 3	2,978		161	17	24,640	25	4,809	12	4	2,539
Michigan	3	5,768	32	2	25		2	2,767		52	6	33,489	20				1,041
Wisconsin		4,549	18				1			572		21,914	6	5,385			[2] 184
W. NO. CEN.																	
Minnesota	6	1,441	55	15	2					28	1	280	4		2		319
Iowa		1,006	32	1	1		2	62		207	1	2,549	3	2,356			242
Missouri		698	36	2	3	1	1			30	11	5,995	6	312		1	451
North Dakota		390	16							42		300	1	138			210
South Dakota		116	17							2		133	3	74			58
Nebraska		257	16							2	1	235	0	191			8
Kansas		1,027	67		1		12	89		63	4	8,230	6	418		1	468
SO. ATL.																	
Delaware		104	1					19				1,700	0	45			13
Maryland		1,188	37	3	9	5		7,037		104	3	4,933	41	1,076	1	2	1,090
Dist. of Col.		430	12							8		3,186	2	180		1	255
Virginia		771	90		529					2,126	25	18,546	42	859		22	916
West Virginia		337	66		2		1			128	2	7,325	13	602		2	84
North Carolina		1,168	111		4			8,306		107	19	18,162	16			14	92
South Carolina		688	210				(4)	3,164	294	3,103	2,267	8,125	9	707	6	449	1,421
Georgia		335	50	10	101	3	1		1,674	805	273	6,708	2	523		50	454
Florida		462	36	11	8		1	524	2,492	759	38	6,529	5	258		9	290

[1] 41 cases of ophthalmia neonatorum and suppurative conjunctivitis reported.
[2] Lobar pneumonia only.
[3] 16 cases of unspecified type also reported.
[4] 7 cases of unspecified type reported.
[5] Exclusive of New York City.

CONSOLIDATED MONTHLY STATE REPORTS FOR APRIL, MAY, AND JUNE 1941—Continued

Division and State	Actinomycosis	Chickenpox	Diphtheria	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	German measles	Hookworm disease	Influenza	Malaria	Measles	Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms
E. SO. CEN.																	
Kentucky		592	50	2	49			1, 296		137	10	12, 508	16	2, 411		4	207
Tennessee	1	460	49	1	28		3	1, 360		528	103	6, 091	18	1, 240	5	42	1, 212
Alabama		356	72	1			3	513		651	718	5, 420	15	1, 264		76	773
Mississippi		1, 828	51	638	3, 885				1, 964	5, 596	9, 456	10, 047	17	3, 802	42	1, 277	2, 220
W. SO. CEN.																	
Arkansas		223	43	17	95			574	88	1, 031	712	3, 804	6	1, 215		46	376
Louisiana		56	23	1	38				163	67	130	622	10	96		6	285
Oklahoma		248	55	2	36		3		8	535	439	1, 609	4	543	2	15	494
Texas		2, 518	260	100	774		18			6, 714	1, 893	12, 699	28	8, 025	33	491	2, 209
MOUNTAIN																	
Montana		847	20	1	4		4	151		42		440	3	102			25
Idaho		79	2					39		9		259	0	160			9
Wyoming		188	15				1	70		2		923	0	105			6
Colorado		1, 532	113				1			263		5, 108	3	1, 126			145
New Mexico		416	16	7	6	2	3	252		23	9	2, 324	0	406		6	254
Arizona		368	33			494	1	148		1, 009	1	1, 303	1	426	1	9	485
Utah		1, 351	14	1			3	1, 711		151		466	1	301			118
Nevada		67					1			9		334	0	24			31
PACIFIC																	
Washington		2, 061	15		3		[5] 5	4, 102		69	1	609	5	2, 978			75
Oregon		717	28	4						115	6	2, 352	7	373			142
California		13, 769	187	80	149		16	14, 542		4, 930	59	6, 400	25	12, 924	8		[2] 607
Total	12	90, 297	2, 856	937	5, 931	505	[5] 124	109, 149	6, 683	30, 591	16. 242	476, 131	559	77, 268	161	2, 534	31. 430
Second quarter 1940	13	81, 547	2, 844	796	5, 201	326	181	3, 825	9, 254	23 282	17, 609	133, 067	432	42, 156	408	2, 817	35, 304
Alaska		71						971		142		199		24			31
Hawaii		392	26	8	27			278	28	31		561		85			[2] 39

[5] 1 case of equine type included.

Lobar pneumonia only.

CONSOLIDATED MONTHLY STATE REPORTS FOR APRIL, MAY, AND JUNE 1941—Continued

Division and State	Poliomyelitis	Puerperal septicemia	Rabies in animals	Rabies in man	Rocky Mountain spotted fever	Scarlet fever	Septic sore throat	Smallpox	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms	Tularemia	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Vincent's infection	Whooping cough
NEW ENG.																		
Maine	1				0	88	7	0				136		6		11	3	305
New Hampshire	1				0	29	3	0				53		4		11		114
Vermont	0				0	103		0				25		6		18	26	173
Massachusetts	2		6		0	2,343	58	0	9	4	11	1,003		52		32		2,943
Rhode Island	0		2		0	163	42	0				506		2		5	1	338
Connecticut	1				0	735	85	0	3		2	352		15	1	42		793
MID. ATL.																		
New York	11		45		4	5,780	224	0	13		68	4,218		97	8	82	[6] 136	3,719
New Jersey	6		76		2	2,799	49	0	3	2	6	975		25	2	11		1,372
Pennsylvania	10			2	2	4,285		0	1	1	1	623	3	87		19		4,434
E. NO. CEN.																		
Ohio	10	4		2	1	3,132	34	6	2	1	3	1,389	2	49		28		4,403
Indiana	1				1	1,136	5	11		4		426		19		4		423
Illinois	14		89		2	3,429	28	45	5	93	4	2,526	6	56		51	64	1,204
Michigan	4	1	26		0	3,042	297	58	2		3	1,402	1	26		39	41	4,396
Wisconsin	5				0	1,314	5	59				302	2	4	1	35		1,544
W. NO. CEN.																		
Minnesota	9		8		0	578	30	9	4	2		554	10	10		53		1,266
Iowa	2		18		5	412	44	53				[7] 113	3	15		65		548
Missouri	0		1		4	1,252	27	41	2	123		628	9	17		5		672
North Dakota	0				0	32	12	5		1		91	2	5		4	18	202
South Dakota	4				4	118	4	50		4		79		1		3		220
Nebraska	0				0	185	1	3				50		2		1		202
Kansas	1		4		0	367	30	4		2		279	8	17	3	18	34	1,850
SO. ATL.																		
Delaware	0		5		5	186		0				[7] 31		1		1		44
Maryland	3				14	460	102	0	2		1	904	1	21	1	7	66	1,175
Dist. of Col.	0				0	129		0				585		8				196
Virginia	6				8	289	1,167	0		2		[7] 845	3	38	1	4		1,261
West Virginia	3				1	429	44	4				551		51		1		733
North Carolina	6				1	230	33	3				1,294	3	35	8	2	8	3,732
South Carolina	7		97		0	63	18	3	18			277	1	48	6	5		2,007
Georgia	36				1	167	167	6			2	459	17	85	95	45		401
Florida	63				0	35		0			1	220	1	64	39	4	12	245

[6] Exclusive of New York City.

[7] Respiratory only.

CONSOLIDATED MONTHLY STATE REPORTS FOR APRIL, MAY, AND JUNE 1941—Continued

Division and State	Poliomyelitis	Puerperal septicemia	Rabies in animals	Rabies in man	Rocky Mountain spotted fever	Scarlet fever	Septic sore throat	Smallpox	Tetanus	Trachoma	Trichinosis	Tuberculosis, all forms	Tularemia	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Vincent's infection	Whooping cough
E. SO. CEN.																		
Kentucky	7				1	1,113	121	19		70		512	2	61		3		853
Tennessee	7	1		1	3	705	115	11	1	24		970	9	58	3	4	18	887
Alabama	18		52		1	164		1	0			923	9	15	45	9		760
Mississippi	16	74			1	80		15		18		433	15	35	10	8		3,418
W. SO. CEN.																		
Arkansas	8	2	62	1	0	63	457	16	4	577		330	38	50	1	5		503
Louisiana	9		17		0	58	62	3	6	1		[7] 367	6	96	15	14		134
Oklahoma	6				2	190	211	15	2	188		611	8	45		37	21	238
Texas	22		20		0	497		16		41		951	14	157	105	116		4,280
MOUNTAIN																		
Montana	3				82	240	14	1		3		147	17	6		5	1	230
Idaho	0				9	70	1	2		1		[7] 10		6		2	3	180
Wyoming	2				62	95	7	0				7	20	1				57
Colorado	2				18	298	18	2				[7] 167	2	13		11		2,387
New Mexico	3	3	28	1	0	54	9	0	1			255	2	19		3		327
Arizona	5				0	66	7	9		175		402		8	2	9		460
Utah	0				7	103	8	1		24		40	19	4		3		906
Nevada	0				3	6		1				26		3				73
PACIFIC																		
Washington	3		25		2	205	5	10		3	1	639	2	18		15	11	1,594
Oregon	8		11		5	103	19	36				134		21		3	21	296
California	53		100		0	1,465	16	6	18	36	16	2,469	6	59	7	85		9,066
Total	368	85	692	7	251	38,889	3,586	524	102	1,400	119	30,289	241	1,541	353	938	494	67,684
Second quarter 1940	416	90	866	11	192	51,037	2,952	846	102	864	147	23,024	226	1,677	261	968	470	49,265
Alaska	4						20					199		1		1	3	9
Hawaii						9			7	3	13	175		29	23			75

Anthrax: Vermont, 1; Massachusetts, 2; New York, 4; New Jersey, 4; Pennsylvania, 5; Delaware, 1; Arizona, 1.
Botulism: Illinois, 1; California, 3.
Colorado tick fever: Wyoming, 7; Colorado, 7.
Dengue: South Carolina, 6; Florida, 1; Mississippi, 10; Louisiana, 18; Texas, 26.
Diarrhea: Ohio, 31 (under 2 years; enteritis included); Michigan, 48 (infant diarrhea); Maryland, 15; South Carolina, 3,202; New Mexico, 10 (enteritis included).
Enteritis: Kansas, 1; Washington, 17 (8, under 2 years; 9, over 2 years).
Food poisoning: Illinois, 10; Kansas, 6; California, 207.
Granuloma, coccidioidal: California, 10.
Leprosy: Hawaii Territory, 8; Minnesota, 1; Louisiana, 3; Texas, 5; California, 2.
Plague: California, 1.
Psittacosis: New York, 2; Illinois, 1; District of Columbia, 1.
Rat bite fever: Illinois, 2.
Relapsing fever: Kansas, 1; Texas, 2; California, 1.
Weil's disease: Michigan, 10; Maryland, 4.

[7] Respiratory only.

WEEKLY REPORTS FROM CITIES

City reports for week ended August 16, 1941

This table lists the reports from 134 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	1	0	0	0	0	6	25
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	6
Manchester	0	------	0	0	0	1	0	1	0	0	15
Nashua	0	------	0	0	0	0	0	0	0	0	5
Vermont:											
Burlington	0	------	0	1	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	2
Massachusetts:											
Boston	0	------	0	7	5	11	0	5	2	35	154
Fall River	0	------	0	0	1	4	0	2	0	6	29
Springfield	0	------	0	5	0	1	0	0	0	8	37
Worcester	0	------	0	1	4	0	0	0	0	7	46
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	15
Providence	0	------	0	5	0	1	0	3	1	13	62
Connecticut:											
Bridgeport	0	------	0	7	1	0	0	1	0	1	28
Hartford	0	------	0	2	0	0	0	0	0	1	33
New Haven	0	------	0	2	0	1	0	1	0	1	45
New York:											
Buffalo	0	------	0	5	5	5	0	7	0	16	130
New York	11	3	0	30	43	14	0	73	3	126	1,188
Rochester	0	------	0	6	2	1	0	2	0	8	57
Syracuse	0	------	0	0	1	0	0	1	1	15	40
New Jersey:											
Camden	0	------	0	0	3	0	0	2	0	8	31
Newark	0	1	0	1	2	3	0	3	0	26	71
Trenton	0	------	0	0	1	1	0	1	0	2	49
Pennsylvania:											
Philadelphia	0	------	0	1	16	13	0	19	6	37	401
Pittsburgh	2	------	0	4	6	5	0	6	2	11	132
Reading	0	------	0	1	0	0	0	2	0	0	19
Scranton	0	------	------	1	------	0	0	------	0	1	------
Ohio:											
Cincinnati	0	------	0	0	2	5	0	8	0	9	136
Cleveland	0	------	0	2	1	3	0	14	1	58	169
Columbus	0	------	0	4	3	3	0	1	0	10	85
Toledo	0	------	0	9	2	2	0	2	0	33	63
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	11
Fort Wayne	0	------	0	0	0	0	0	0	1	0	27
Indianapolis	0	1	0	4	3	1	0	3	0	7	89
Muncie	0	------	0	0	0	1	0	0	0	2	6
South Bend	0	------	0	0	0	0	0	0	0	0	17
Terre Haute	0	------	0	0	0	0	0	0	0	0	8
Illinois:											
Alton	0	------	0	0	1	0	0	0	0	0	9
Chicago	2	------	0	4	9	14	0	34	0	128	553
Elgin	0	------	0	0	0	0	0	0	0	7	3
Moline	0	------	0	0	0	0	0	0	0	4	14
Springfield	0	------	0	4	3	2	0	0	0	0	16
Michigan:											
Detroit	1	1	0	12	1	23	0	9	1	94	197
Flint	0	------	0	1	1	1	0	0	0	1	27
Grand Rapids	0	------	0	0	0	0	0	0	2	7	30
Wisconsin:											
Kenosha	0	------	0	1	0	0	0	0	0	1	6
Madison	0	------	0	14	0	0	0	0	0	1	23
Milwaukee	0	------	0	14	3	10	0	3	0	120	80
Racine	0	------	0	1	0	0	0	0	0	1	19
Superior	0	------	0	0	0	2	0	0	0	7	10
Minnesota:											
Duluth	0	------	0	0	0	0	0	0	0	12	17
Minneapolis	0	------	0	1	1	2	0	2	0	21	95
St. Paul	1	------	0	1	3	1	0	0	0	11	42
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	1	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	1	------	------	4	------	3	0	------	1	4	34
Sioux City	1	------	------	0	------	0	0	------	0	8	------
Waterloo	0	------	------	1	------	0	0	------	0	5	------

City reports for week ended August 16, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Missouri:											
Kansas City	1	------	0	1	4	0	0	3	0	5	89
St. Joseph	0	------	0	1	3	0	0	0	0	0	22
St. Louis	2	------	1	3	7	4	0	4	0	24	149
North Dakota:											
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	2	0	0	0	0	0	0	13
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	9
Nebraska:											
Lincoln	0	------	------	0	------	1	0	------	0	0	------
Omaha	0	------	0	0	1	0	0	1	0	0	61
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	6	1
Topeka	0	------	0	0	0	0	0	1	0	26	10
Wichita	0	------	0	3	1	2	0	0	0	1	24
Delaware:											
Wilmington	0	------	0	0	2	0	0	0	0	4	27
Maryland:											
Baltimore	0	1	1	33	8	3	0	7	1	52	182
Cumberland	0	------	0	0	1	0	0	0	0	0	9
Frederick	0	------	0	1	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	1	2	1	6	4	7	0	11	0	1	155
Virginia:											
Lynchburg	0	------	0	12	0	0	0	0	0	3	5
Norfolk	0	------	0	0	2	1	0	3	0	2	36
Richmond	0	------	0	1	2	1	0	0	0	0	35
Roanoke	0	------	0	0	0	0	0	1	0	0	14
West Virginia:											
Charleston	0	------	0	1	2	0	0	0	1	0	18
Huntington	2	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	1	0	0	0	1	0	0	20
North Carolina:											
Gastonia	0	------	------	0	------	1	0	------	0	1	------
Raleigh	0	------	0	0	0	0	0	0	0	3	3
Wilmington	0	------	0	0	0	0	0	0	1	21	10
Winston-Salem	0	------	0	0	0	0	0	0	0	1	16
South Carolina:											
Charleston	0	1	0	0	1	0	0	0	0	0	16
Florence	0	------	------	0	------	1	0	------	0	0	------
Greenville	0	------	0	0	0	0	0	0	0	1	15
Georgia:											
Atlanta	0	2	0	0	2	1	0	4	0	1	81
Brunswick	0	------	0	0	0	0	0	0	0	0	6
Savannah	0	------	1	2	1	0	0	2	0	1	28
Florida:											
Miami	0	------	0	0	3	0	0	2	0	1	27
St. Petersburg	0	------	0	0	1	0	0	0	0	0	25
Tampa	0	------	0	0	0	0	0	0	0	0	27
Kentucky:											
Ashland	0	------	0	2	0	0	0	1	0	0	10
Covington	0	1	0	0	1	0	0	0	0	0	14
Lexington	0	------	0	0	0	0	0	1	0	6	12
Louisville	0	1	0	0	6	1	0	3	1	21	71
Tennessee:											
Knoxville	0	------	0	1	0	0	0	1	2	1	29
Memphis	0	------	1	1	0	0	0	5	2	9	60
Nashville	0	------	0	2	1	0	0	2	0	4	42
Alabama:											
Birmingham	0	------	0	1	3	1	0	6	0	1	85
Mobile	1	1	1	1	2	0	0	1	0	0	18
Montgomery	0	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Little Rock	0	------	0	1	3	0	0	1	0	0	34
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	0	4
New Orleans	1	------	0	1	8	1	0	8	1	9	172
Shreveport	0	------	0	0	4	1	0	3	1	0	30
Oklahoma:											
Oklahoma City	0	1	0	0	3	0	0	0	0	0	38
Tulsa	0	------	0	0	1	0	0	0	0	7	16
Texas:											
Dallas	0	------	0	9	0	1	0	3	1	5	55
Fort Worth	0	------	0	0	2	0	0	3	0	0	37
Galveston	0	------	0	0	1	0	0	0	0	1	11
Houston	2	------	0	1	3	3	0	6	0	0	80
San Antonio	1	5	0	0	1	0	0	8	1	1	63

City reports for week ended August 16, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Montana:											
Billings	0	------	0	0	0	0	0	0	0	1	9
Great Falls	0	------	0	0	0	0	0	0	0	13	10
Helena	0	------	0	0	0	0	0	0	0	5	2
Missoula	0	------	0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	0	0	1	0	1	8
Colorado:											
Colorado Springs	0	------	0	0	2	0	0	0	0	3	13
Denver	4	5	0	0	3	0	0	4	0	74	84
Pueblo	0	------	0	0	0	1	0	0	1	7	7
New Mexico:											
Albuquerque	0	------	0	0	2	0	0	1	0	2	12
Arizona:											
Phoenix	0	4	------	3	------	0	0	------	1	10	------
Utah:											
Salt Lake City	0	------	0	2	2	0	0	0	1	17	25
Washington:											
Seattle	1	------	0	0	5	0	0	4	0	37	91
Spokane	0	------	0	0	0	3	0	0	0	4	33
Tacoma	0	------	0	0	0	1	0	0	0	2	21
Oregon:											
Portland	0	------	0	0	1	0	0	0	0	4	72
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	3	5	1	13	4	7	0	10	1	51	296
Sacramento	0	------	0	0	1	1	0	3	2	6	35
San Francisco	0	------	0	4	4	0	0	11	0	22	165

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Worcester	0	0	1
Rhode Island:			
Pawtucket	1	1	0
Providence	0	0	2
Connecticut:			
Bridgeport	0	0	3
Hartford	0	0	3
New York:			
Buffalo	0	1	1
New York	2	0	16
Rochester	0	0	2
Pennsylvania:			
Philadelphia	1	1	7
Pittsburgh	0	0	2
Ohio:			
Cincinnati	0	0	1
Cleveland	0	0	30
Toledo	0	0	1
Indiana:			
Fort Wayne	0	0	1
Illinois:			
Chicago	0	0	7
Springfield	0	0	2
Michigan:			
Detroit	0	0	6
Wisconsin:			
Madison	0	0	1
Milwaukee	0	0	1
Superior	0	0	2
Minnesota:			
Minneapolis	0	0	2
St. Paul	0	0	6
Missouri:			
St. Joseph	0	1	0
St. Louis	0	0	1

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Delaware:			
Wilmington	0	0	1
Maryland:			
Baltimore	2	2	10
District of Columbia:			
Washington	0	0	8
Virginia:			
Lynchburg	0	0	1
Georgia:			
Atlanta	0	0	9
Savannah	0	0	3
Florida:			
St. Petersburg	0	0	1
Tampa	0	0	1
Kentucky:			
Louisville	0	0	3
Tennessee:			
Knoxville	0	0	5
Albama:			
Birmingham	0	0	9
Mobile	0	0	1
Montgomery	0	0	2
Louisiana:			
New Orleans	0	0	2
Oklahoma:			
Tulsa	0	0	2
Texas:			
Houston	0	0	1
Montana:			
Billings	0	0	1
Utah:			
Salt Lake City	0	0	1
Washington:			
Seattle	0	0	2
California::			
Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: Fall River, 2; New York, 6; Toledo, 1; Chicago, 1; Duluth, 2; Minneapolis, 5; St. Paul, 4; Sioux City, 4; Fargo, 17; Grand Forks, 22; Minot, 28; Aberdeen, 2; Omaha, 5; Wichita, 1. Deaths: Fall River, 1; New York, 2, Toledo, 1; Duluth, 1; Minneapolis, 1; St. Paul, 1; Fargo, 1; Omaha, 2; Lawrence, 1; Baltimore, 1; St. Petersburg, 1.

Pellagra.—Cases: Atlanta, 1; Savannah, 2.

Typhus fever.—Cases: Charleston, S. C., 1; Brunswick, 1; Savannah, 5; Miami, 1; Tampa, 1; New Orleans, 3; Fort Worth, 2; Houston, 3; San Antonio, 1. Deaths: Savannah, 1.

Rates (annual basis) per 100,000 population for a group of 88 selected cities (population, 1940, 33,885,623)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Aug. 16, 1941	5.2	4.3	1.1	34.9	31.5	25.4	0.0	43.3	5.2	188.8
Average, 1936–40	10.3	3.9	1.6	40.3	40 0	33.5	0.3	51.4	10.7	196.8

PLAGUE INFECTION IN GROUND SQUIRREL AND FLEAS IN SISKIYOU COUNTY, CALIF.

Under date of August 19, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported that plague infection had been proved, by animal inoculation and cultures, in organs from 1 ground squirrel, *C. douglasii*, submitted to the laboratory on August 1 from a ranch 8 miles east and 3 miles south of Montague, Siskiyou County, Calif., and also that plague infection was found in a pool of 183 fleas taken from 18 ground squirrels of the same species on June 30 at the same location.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended July 26, 1941.—During the week ended July 26, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		3	1		7		1	1	2	15
Chickenpox		6		30	61	9	34	40	18	198
Diphtheria	4	15	1	20	1	1		2		44
Dysentery				6						6
Influenza									2	2
Measles		3		105	103	10	13	14	68	316
Mumps				52	43	6	7	8	7	123
Pneumonia		2			2				2	6
Poliomyelitis			7		1	83	1		3	95
Scarlet fever		8	2	33	112	7	8	6	4	175
Trachoma							2			2
Tuberculosis	2	4	11	85	65	4				171
Typhoid and paratyphoid fever				17	6		1	2	1	27
Whooping cough		2		101	120	4		1	21	249

Manitoba—Poliomyelitis.—During the week ended August 29, 1941, 83 cases of poliomyelitis were reported in the Province of Manitoba (162 for the preceding week), bringing the total to 680, of which 221 have been reported in Winnipeg and adjacent suburban areas. The disease is stated to be of mild type, the mortality rate now being about 1.5 percent. Twenty-six percent of the cases have occurred in children between the ages of 10 and 14 (the 5-year age group showing the highest incidence), and 91 percent have been in persons under 25 years of age. The ratio of male to female patients has been about 2½ to 1 (71 percent males, 29 percent females).

Manitoba—Encephalitis.—During the week ended August 29, 1941, 190 cases of encephalitis (epidemic or lethargic) were reported in the Province of Manitoba as compared with 127 for the preceding week. This brings the total to 339 cases during the past three weeks. The disease is stated to be of comparatively mild type, with a mortality rate of about 8 percent. The incidence has been highest in the older age group, only 9 percent of the cases having occurred in children under 5 years of age, while 21 percent occurred in persons 60–69 years of age (the 5-year age group of highest incidence). The ratio of male to female patients has been 1½ to 1 (60 percent males, 40 percent females).

COSTA RICA

Communicable diseases—July 1941.—During the month of July 1941, certain communicable diseases were reported in Costa Rica as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Chickenpox	5		Poliomyelitis	3	
Diphtheria	36	4	Scarlet fever	58	
Measles	7		Typhoid and paratyphoid fever	15	2
Mumps	2				

JAMAICA

Notifiable diseases—4 weeks ended August 2, 1941.—During the 4 weeks ended August 2, 1941, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	2	17	Scarlet fever	1	3
Diphtheria		2	Tuberculosis	22	72
Dysentery	3		Typhoid fever	7	28
Leprosy	1	3			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

Venezuela—Bolivar State—Guasipati.—Yellow fever was reported present on July 6, 1941, in Guasipati, Bolivar State, Venezuela.

X

Public Health Reports

VOLUME 56 **SEPTEMBER 12, 1941** NUMBER 37

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • SEPTEMBER 12, 1941 • *No. 37*

THE CORRELATION BETWEEN NEUTRALIZING ANTIBODIES IN SERUM AGAINST INFLUENZA VIRUSES AND SUSCEPTIBILITY TO INFLUENZA IN MAN [1]

By E. R. Rickard, F. L. Horsfall, Jr., G. K. Hirst, and E. H. Lennette

There is now a considerable body of evidence *(1–8)* which indicates that the symptom-complex termed influenza is not a single disease entity but is instead a syndrome of diverse etiology. Except in the case of influenza A *(9)* nothing is known of the significance of neutralizing antibody levels against the viruses etiologically related to influenza. In this disease it has been suggested *(10–12)* that persons who possessed low antibody levels against influenza A virus were more susceptible than were persons who possessed high antibody levels. Recently it was reported *(3)* that in a group of normal persons whose antibody levels against this virus had been determined prior to the occurrence of an outbreak of influenza A, the attack rate for this disease was highest in the lowest antibody range and decreased progressively as antibody levels increased. This evidence indicated that in influenza A there was a correlation between low antibody levels and susceptibility as well as between high antibody levels and resistance to the disease. However, the data did not indicate that any concentration of neutralizing antibodies, however high, would assure complete immunity against influenza A.

In the case of influenza B *(5)*, as well as in influenza of unknown cause *(8)*, no evidence has as yet been adduced concerning the significance of antibody levels against either of the two known influenza viruses and susceptibility, or resistance, to these diseases.

The development of a quantitative neutralization technique *(13)* by which the concentration of antibodies against influenza A virus in a serum can be measured with reproducible results has permitted the study of a number of sera in different tests and direct comparisons between the results obtained. Since it has been shown *(14)* that a

[1] From the Laboratories of the International Health Division of The Rockefeller Foundation, New York.

linear relationship exists between the quantity of virus neutralized and the quantity of serum used, it is possible to calculate the maximum quantity of virus which can be neutralized by a given serum. This quantity has been termed the neutralizing capacity, and it has been found that it is a constant value for a given serum irrespective of the amount of virus used in the neutralization test.

During the past 3 years serum has been obtained from a considerable number of normal individuals. During the same interval acute-phase and convalescent sera were obtained from a number of cases of influenza which occurred during epidemics in the same geographical areas. The neutralizing capacities of these sera against influenza A virus, influenza B virus, or both, were determined, and in each case of influenza an etiological diagnosis was established by means of appropriate laboratory tests.

It is the purpose of this paper to present the results of these studies and to show that there are correlations between the different levels of specific neutralizing antibodies and susceptibility, or resistance, to infection by the different agents etiologically related to influenza.

MATERIAL AND METHODS

Serum.—Serum was obtained from normal individuals who had not been exposed to an epidemic of influenza for at least 2 years. Serum was also obtained from cases of influenza during epidemics of this disease which occurred in 1939, 1940, and 1941. From patients with influenza serum was obtained either prior to the illness, or during the first few days of the disease, and again during convalescence, so that an etiological diagnosis could be established in each case. All cases from which acute-phase serum was taken later than the fifth day after clinical onset have been excluded from this analysis because of the possibility that after this interval an increase in antibodies might have resulted as a specific response to the infection itself. All sera were stored at 4° C.

Viruses.—The PR8 strain *(15)* of influenza A virus *(9)* and the Lee strain *(5)* of influenza B virus were used throughout this study. Both viruses were propagated in mouse lungs. Standard suspensions of infected mouse lungs were prepared as described previously *(13)* and were stored in a low temperature cabinet *(16)* at −76° C. between tests.

Neutralization tests.—Neutralization tests were carried out in a manner identical to that previously described *(12)*. All sera prior to dilution were inactivated by heating to 56° C. for 30 minutes. Falling fourfold dilutions of serum in saline were mixed with a constant amount of the desired virus. The serum-virus mixtures were inoculated intranasally into groups of three or four lightly anesthetized albino mice

which were then observed for a period of 11 days. In parallel with each neutralization test a titration of the virus suspension used was carried out in a manner identical to that previously described (*13*). In order to determine the neutralizing capacity of each serum studied, it was necessary to cover the wide range of capacities from log 1.76 to log 6.96. It was found that the most efficient means of accomplishing this was to use between 310 and 3,100 fifty percent mortality doses of either virus against three or four serial dilutions of serum in the initial neutralization test. In those instances in which too much antibody was present to give an end point under these conditions, higher dilutions were tested subsequently against the larger quantity of virus. In those instances in which too little antibody was present to give an end point under these conditions, dilutions of the serum were tested subsequently against smaller quantities of virus. With some sera it was necessary to use between 10 and 30 fifty percent mortality doses of virus in order to obtain end points.

Calculation of neutralizing capacity.—The neutralizing capacity of each serum tested was calculated from the serum dilution end point and the quantity of virus used in the test by means of the equation (*14*)

$$\log b = y - (a \cdot \log x).$$

Both the serum dilution end points and the virus titration end points were calculated by the 50 percent end point method of Reed and Muench (*17*). As was stated in the preceding paper (*8*), it has been found that the linear relationship between the quantity of serum used and the quantity of virus neutralized was operative with influenza B virus just as it was with influenza A virus. Therefore, it was equally possible to calculate the desired neutralizing capacity whichever virus was used.

Determination of etiology of influenza.—Acute-phase and convalescent sera from each case of influenza were studied. In the great majority of cases the neutralizing capacities against influenza A virus, influenza B virus, or both, of the two serum specimens were determined. An increase during convalescence in neutralizing capacity against either virus of log 0.86 was taken to be a significant increase in antibodies, and therefore to indicate that infection by the homologous virus had occurred. This increase in neutralizing capacity corresponded to a fourfold increase in neutralizing titer. In the remaining cases the titers of complement-fixing antibodies against either influenza A virus, influenza B virus, or both of the acute-phase and convalescent sera, were determined by the methods described by Eaton and Rickard (*18*) and Francis (*6*). An increase of one dilution or more in the complement-fixing titer of the convalescent serum was considered to indicate a significant increase in antibodies and was, therefore, taken as evidence that infection by the homologous virus

had occurred. Cases in which a significant increase in antibodies against influenza A virus was demonstrated were designated influenza A. Cases in which a significant increase in antibodies against influenza B virus was demonstrated were designated influenza B. Cases in which no significant increase in antibodies against either virus was demonstrable were classified as influenza of unknown cause. For the purposes of this study these latter cases have been termed "influenza Y".

EXPERIMENTAL

Neutralizing antibodies against influenza A virus in normal individuals.—The neutralizing capacities against the PR8 strain of influenza A virus of serum obtained from a number of normal persons were determined by the method described above. So-called "standard neutralization titers" determined on the serum from 1,101 of these individuals have been reported previously (*3*). Neutralizing capacity ranges were chosen which permitted the grouping of various antibody levels in order to simplify the analysis. The ranges were purposely selected so as to correspond with certain "standard neutralization titer" ranges and thus to facilitate comparisons with earlier data (*3, 19*). The number of individuals who possessed sera with neutralizing capacities in a given range was determined, and the frequency with which capacities in this range occurred among the whole group was calculated. The results are shown in table 1. It was found

TABLE 1.—*Distribution of neutralizing capacities against influenza A virus in serum of normal individuals, cases of influenza A, influenza B, and influenza "Y"*

Neutralizing capacity range against influenza A virus (log.)	Normal individuals		Cases of influenza A			Cases of influenza B			Cases of influenza "Y"		
	Number	Percent	Number	Percent	A/N ratio	Number	Percent	B/N ratio	Number	Percent	"Y"/N ratio
<2.63	243	18 4	72	23.2	1.28						
2.63 to 3.49	114	8.6	56	18 1	2 10	3	9 4	0 35	12	11.6	0.43
3.50 to 4.35	240	18.2	94	30.3	1.66	11	34.4	1.89	24	23.3	1.28
Combined					1.58			.97			.77
4.36 to 5 22	450	34.1	63	20.3	.59	11	34.4	1.01	33	32.0	.94
5.23 to 6 09	238	18.0	23	7.4	.41	7	21.9	1.22	34	33.0	1.82
6.10 to 6.96	36	2.7	2	.6	.22	0			0		
Total	1,321	100 0	310	100.0		32	100.0		103	100 0	

that 597 individuals, or 45.2 percent, of the group of 1,321 possessed sera with neutralizing capacities against this virus of log 4.35 or less. A random sample of 359, or 60.2 percent, of the sera from these individuals was tested against small quantities of virus as described above so as to obtain a reasonable approximation of the frequencies with which the three lowest neutralizing capacity ranges occurred. It was found that 40 percent. 19.1 percent, and 40.7 percent of these sera

had antibody levels in the ranges log 4.35 to 3.50, log 3.49 to 2.63, and log 2.62 or less, respectively. From these data the number of normal individuals with serum in the three lowest ranges was calculated. It will be noted that there were wide differences between the amounts of neutralizing antibodies against influenza A virus possessed by normal individuals. Neutralizing capacities in the range log 6.10 to 6.96 were, on the average, 20,000 times greater than those in the range log 2.62 or less. The largest number of individuals in one neutralizing capacity range occurred in the range log 4.36 to 5.22. Sera in this range were capable of neutralizing between 22,000 and 165,000 fifty percent mortality doses of influenza A virus per 0.05 cc. The frequency of antibody levels both above and below this range was found to diminish progressively, with the exception of the range log 2.62 or less in which there were more individuals than might be expected on the basis of a normal distribution curve. It should be pointed out that this range includes all neutralizing capacities from 0 to log 2.62, and therefore that it is three times broader than any of the higher ranges.

Neutralizing antibodies against influenza A virus in influenza A.—The neutralizing capacities against the PR8 strain of influenza A virus of serum obtained either prior to or during the first days of the illness from a number of patients with influenza A were determined. An etiological diagnosis was established in each case by the methods described above. So-called "standard neutralization titers" for the sera of 59 of these cases have been reported previously (*3*). The number of cases with sera in a given neutralizing capacity range was determined, and the frequency with which each range occurred was calculated. The results are shown in table 1. It was found that 128, or 41.3 percent, of the 310 cases possessed sera with neutralizing capacities against influenza A virus of log 3.49 or less. Sera from a random sample of 71, or 55.5 percent, of these cases were tested against smaller quantities of virus as described above in order to obtain the approximate frequencies of occurrence of the two low ranges. It was found that 43.7 and 56.3 percent of these sera had antibody levels in the ranges log 3.49 to 2.63 and log 2.62 or less, respectively. From these data the number of cases in the two low ranges was calculated. It will be observed that the largest number of cases of influenza A in one neutralizing capacity range occurred in the range log 4.35 to 3.50 and that this range was next lower from that in which there was the highest frequency of normal individuals. The frequency with which cases of influenza A were encountered with antibody levels above this range was found to diminish progressively. It is apparent that the distribution of antibody levels among cases of

influenza A was distinctly different from that among normal individuals. The A/N ratios shown in table 1 serve to express this difference in a single term. These ratios were calculated by dividing the frequency with which a given neutralizing capacity range was encountered in the serum of cases of influenza A by the frequency with which the same range was found in the serum of normal individuals. It seems apparent that had influenza A occurred irrespective of the neutralizing capacities against the homologous virus, then, in samples of this size, the A/N ratios should have approximated unity. On the other hand, if the level of neutralizing antibodies against influenza A virus were one of the variables related to the occurrence of influenza A, it would be expected that in the low antibody ranges the A/N ratios would be greater than 1.0, while in the high antibody ranges the ratios should be less than 1.0. The progressive increase in the A/N ratios from 0.22 in the highest range to 2.10 in the next to the lowest range indicated that, in general, the lower the antibody level against the homologous virus of an individual's serum, the more likely was the occurrence of influenza A.

Neutralizing antibodies against influenza A virus in influenza B.—The neutralizing capacities against the PR8 strain of influenza A virus of serum obtained during the first days of illness from a number of patients with influenza B were determined. An etiological diagnosis was established in each case by the methods described above. The number of cases in each neutralizing capacity range was determined and the frequency with which each range occurred was calculated. The results are shown in table 1. Although only 32 cases of influenza B were available for this analysis, it is apparent that the frequency with which various antibody levels against influenza A virus occurred among them was not very different from the incidence of the same levels among normal persons. The ratios B/N serve to express this relationship in one figure and were calculated in a manner identical to that used for the determination of A/N ratios. The ratios 0.35 and 1.89 were undoubtedly the result of the small size of the samples, since when the frequencies of cases of influenza B in both low ranges are combined and compared to the combined normal frequencies in the same ranges the B/N ratio becomes 0.97. It seems obvious that high antibody levels against influenza A virus did not tend to diminish the likelihood of the occurrence of influenza B. In fact, influenza B appears to have occurred without regard to the concentration of antibodies against influenza A virus.

Neutralizing antibodies against influenza A virus in influenza "Y".—The neutralizing capacities against the PR8 strain of influenza A virus of serum obtained during the first days of illness from a number of patients with influenza "Y" were determined. As was stated above,

cases were classified as influenza "Y" only when it was found that no significant increases in antibodies against influenza A and influenza B viruses were demonstrable during convalescence. The number of cases in each neutralizing capacity range was determined and the frequency with which each range occurred was calculated. The results are shown in table 1. To express the relationship between the rfequencies of various antibody levels among normal individuals and cases of influenza "Y" in one figure, "Y"/N ratios have been calculated in a manner identical to that used for A/N ratios. It is apparent that the "Y"/N ratio was the lowest in the lowest antibody ranges and highest in the highest range in which cases occurred. If the frequencies in the two low ranges are combined and compared to the com-

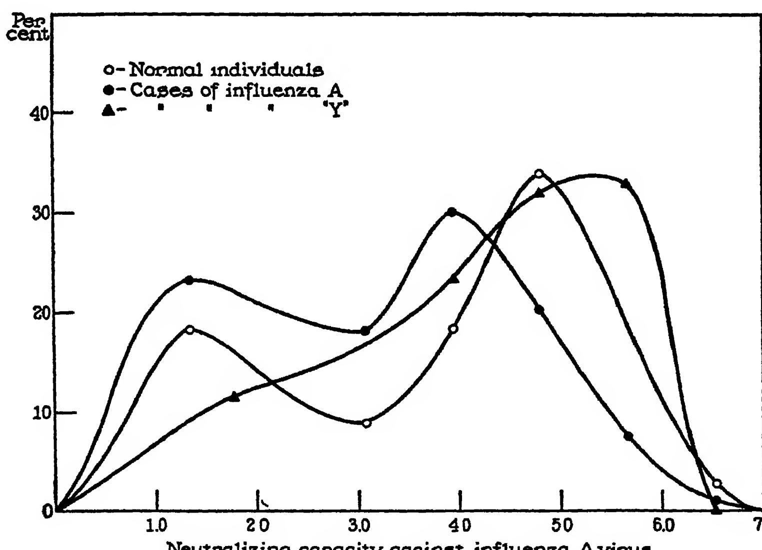


FIGURE 1.—The distribution of neutralizing antibody levels against influenza A virus among 1,321 normal individuals, 310 cases of influenza A, and 103 cases of influenza of unknown cause ("Y").

bined normal frequencies in the same ranges, the "Y"/N ratio becomes 0.77. Under these circumstances it will be noted that the ratios progressively increased as antibody levels became higher. This indicated in general that the greater the concentration of antibodies against influenza A virus possessed by an individual the more likely was the occurrence of influenza "Y". It will be recalled that this finding is the reverse of what was observed among cases of influenza A.

The results of the studies of neutralizing antibodies against influenza A virus are shown graphically in figure 1. The percentage incidence of normal individuals, cases of influenza A, and cases of influenza "Y" have been plotted against the neutralizing capacity ranges. Smooth curves which appeared best to fit the points have

been drawn through them. The tendency for cases of influenza A to occur predominantly among individuals with low antibody levels and for cases of influenza "Y" to occur chiefly among individuals with high antibody levels is clearly shown. In figure 2 are presented the frequency ratios which express the proportional incidences of influenza A, influenza B, and influenza "Y" relative to the distribution of antibody levels among normal individuals. The calculated

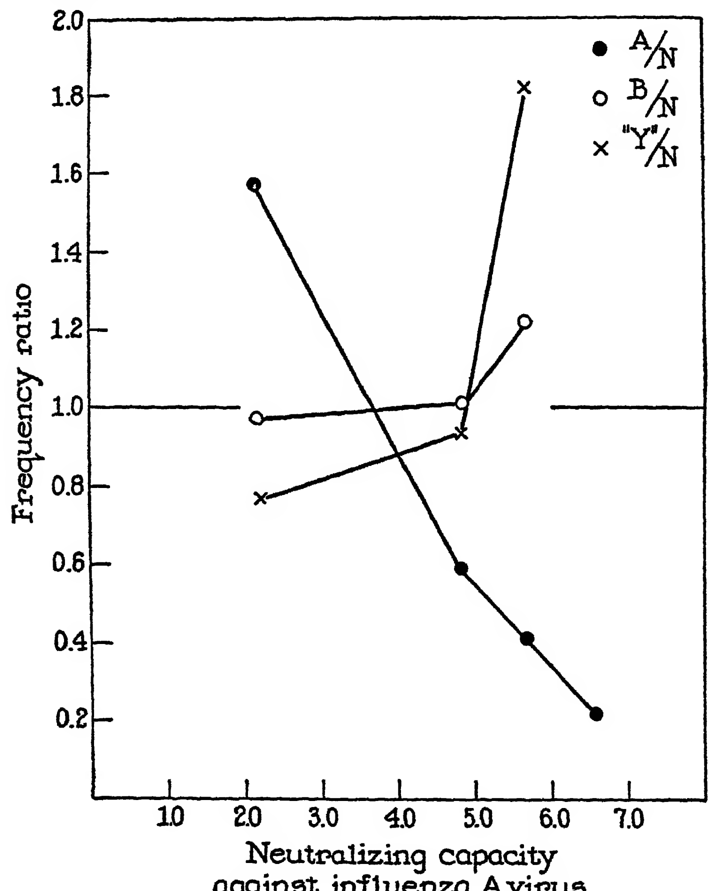


FIGURE 2.—The frequency ratios of neutralizing antibody levels against influenza A virus among cases of influenza A, influenza B, and influenza of unknown cause ("Y") relative to normal individuals.

ratios have been plotted against the neutralizing capacity ranges. The points have been connected by straight lines to assist in the interpretation of results.

Neutralizing antibodies against influenza B virus in clinical influenza.—The neutralizing capacities against the Lee strain of influenza B virus of serum obtained during the first days of illness from a number of cases of clinical influenza were determined. Although an

etiological diagnosis was subsequently established for each case, this group of cases was first analyzed without regard to etiology. Since it has not yet been feasible to determine the antibody levels against influenza B virus of serum from a representative sample of normal individuals, the results obtained in this group of cases were used in lieu of these data. Neutralizing capacity ranges identical with those used in the analysis of antibodies against influenza A virus were chosen in order that comparisons might be facilitated. The number of cases in a given range was determined, and the frequency with which each range occurred was calculated. The results are presented in table 2. It will be observed that there were wide differences in the amounts of neutralizing antibodies against influenza B virus possessed by these individuals. Some cases had neutralizing capacities at least 1,000 times higher than others. The largest number of cases possessed sera in the range log 3.50 to 4.35. Sera in this range were capable of neutralizing between 3,100 and 22,000 fifty percent mortality doses of influenza B virus per 0.05 cc. The frequency of antibody levels below this range diminished gradually. Above this range only 6 cases of influenza were encountered.

TABLE 2.—*Distribution of neutralizing capacities against influenza B virus in serum of cases of clinical influenza, influenza B, influenza A, and influenza "Y"*

Neutralizing capacity range against influenza B virus (log.)	Cases of clinical influenza, all varieties		Cases of influenza B			Cases of influenza A			Cases of influenza "Y"		
	Number	Percent	Number	Percent	B/T ratio	Number	Percent	A/T ratio	Number	Percent	"Y"/T ratio
< 2.63	30	21.3	23	53.5	2.51	3	8.6	0.40	2	4.5	0.21
2.63 to 3.49	50	35.5	11	25.6	0.72	16	45.7	1.29	14	31.8	0.90
Combined	-------	-------	-------	-------	1.39	-------	-------	0.96	-------	-------	0.64
3.50 to 4.35	55	39 0	10	23.3	0.60	14	40.0	1.03	24	54.6	1.40
4.36 to 5.22	3	2.1	0	-------	-------	1	2.8	1.32	2	4.5	2.14
5.23 to 6.09	3	2.1	0	-------	-------	1	2.8	1.32	2	4.5	2.14
Total	141	100 0	44	100.0	-------	35	100.0	-------	44	100.0	-------

Neutralizing antibodies against influenza B virus in influenza B.—The neutralizing capacities against the Lee strain of influenza B virus of acute-phase sera from a number of cases of influenza B were determined. An etiological diagnosis was established by the methods described above. The number of cases in the various ranges was determined, and the frequency of each range calculated. The results are shown in table 2. It will be seen that the largest number of cases occurred in the lowest range and that no cases were found which possessed antibody levels in the two upper ranges. It seems apparent that the distribution of antibody levels among cases of influenza B was different from that among the whole group of cases of clinical influenza even though the former cases were included in the group.

The B/T ratios presented in table 2 serve to express this difference simply. These ratios were calculated by dividing the frequency with which a given neutralizing capacity range was found in the serum of cases of influenza B by the frequency with which the same range was encountered in the serum from the whole group of cases. The progressive increase in the B/T ratios from 0 in the highest range to 2.51 in the lowest range indicated that in this group of cases influenza B occurred with increasing frequency as antibody levels against the homologous virus decreased.

Neutralizing antibodies against influenza B virus in influenza A.—The neutralizing capacities against the Lee strain of influenza B virus of acute-phase sera from a number of cases of influenza A were determined. An etiological diagnosis was established as described above. The number of cases in the various neutralizing capacity ranges was determined and the frequency of each range calculated. The results are presented in table 2. Although the number of cases of influenza A studied in this manner was not large, it is apparent that the distribution of antibodies among them was similar to the distribution in the whole group. The ratios A/T serve to demonstrate this relationship and were calculated in a manner identical to the B/T ratios. With the exception of the ratio 0.40 in the lowest range, the A/T ratios in the lower three ranges were not far from unity. This low ratio was undoubtedly seriously influenced by the fact that of the 30 cases in the lowest neutralizing capacity range 23 were influenza B. If the frequencies of cases of influenza A in both low ranges are combined and compared to the combined frequencies among the whole group in the same ranges, the A/T ratio becomes 0.96. It seems obvious that the various antibody levels against influenza B virus were unrelated to the occurrence of influenza A.

Neutralizing antibodies against influenza B virus in influenza "Y".—The neutralizing capacities against the Lee strain of influenza B virus of acute-phase sera from a number of cases of influenza "Y" were determined. Only those cases in which no significant increases in antibodies against influenza A and B viruses were demonstrable during convalescence were classified as influenza "Y." The number of cases in the various neutralizing capacity ranges was determined and the frequency of each range calculated. The results are shown in table 2. It will be observed that the distribution of antibody levels among these cases was different from that encountered in the whole group. The differences are more clearly evident in the "Y"/T ratios which were calculated in a manner identical to the B/T ratios. In the lower three ranges the "Y"/T ratios progressively increased as antibody levels increased. The ratio 0.21 was probably a direct result of the high proportion of influenza B among the total cases in

the lowest range. If the combined frequencies for influenza "Y" in the two lowest ranges are compared with the combined frequencies in the same ranges for the whole group, the "Y"/T ratio becomes 0.64. Under these conditions there was still an indication that as antibody levels against influenza B virus increased the occurrence of influenza "Y" increased. It will be noted that this is the reverse of what was observed in influenza B.

The results of the studies of neutralizing antibodies against influenza B virus are shown graphically in figure 3. The percentage incidence

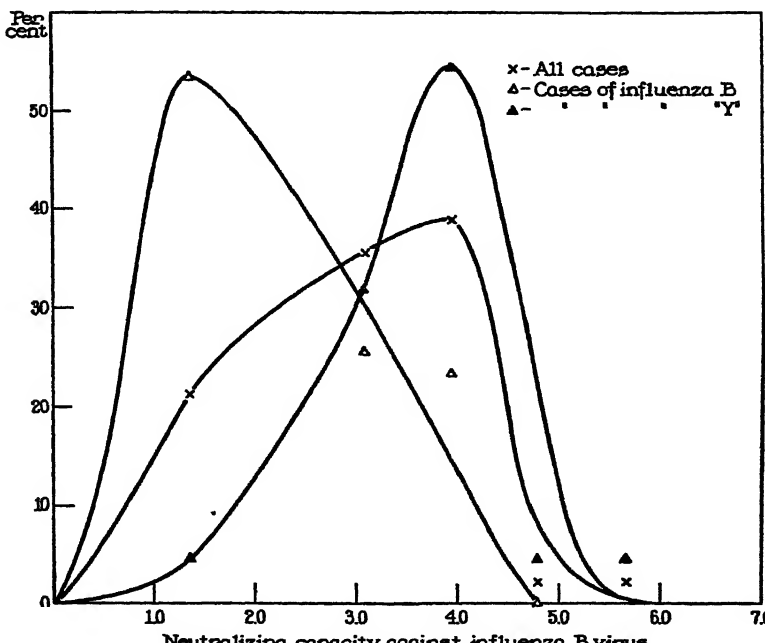


FIGURE 3.—The distribution of neutralizing antibody levels against influenza B virus among 141 cases of clinical influenza irrespective of etiology, 44 cases of influenza B, and 44 cases of influenza of unknown cause ("Y").

of all cases studied, cases of influenza B and cases of influenza "Y," respectively, have been plotted against the neutralizing capacity ranges. Smooth curves which appeared to fit the points well have been drawn. The increased incidence of cases of influenza B among individuals with low antibody levels and of cases of influenza "Y" among those with high antibody levels is evident. In figure 4 are presented the frequency ratios which express the proportional incidences of influenza B, influenza A, and influenza "Y" relative to the distribution of antibody levels among all cases investigated. The calculated ratios have been plotted against the neutralizing capacity ranges. The points have been joined by straight lines to facilitate an appraisal of the trends observed.

DISCUSSION

The variables which are responsible for susceptibility or immunity to influenza in human beings are of obvious importance. A full knowledge of them might be expected to indicate those which were of most significance in determining resistance to these diseases. This information should be of great value in attempts to increase immunity to the infection since the method of preference would reasonably be that one which most augmented the more important factor or factors.

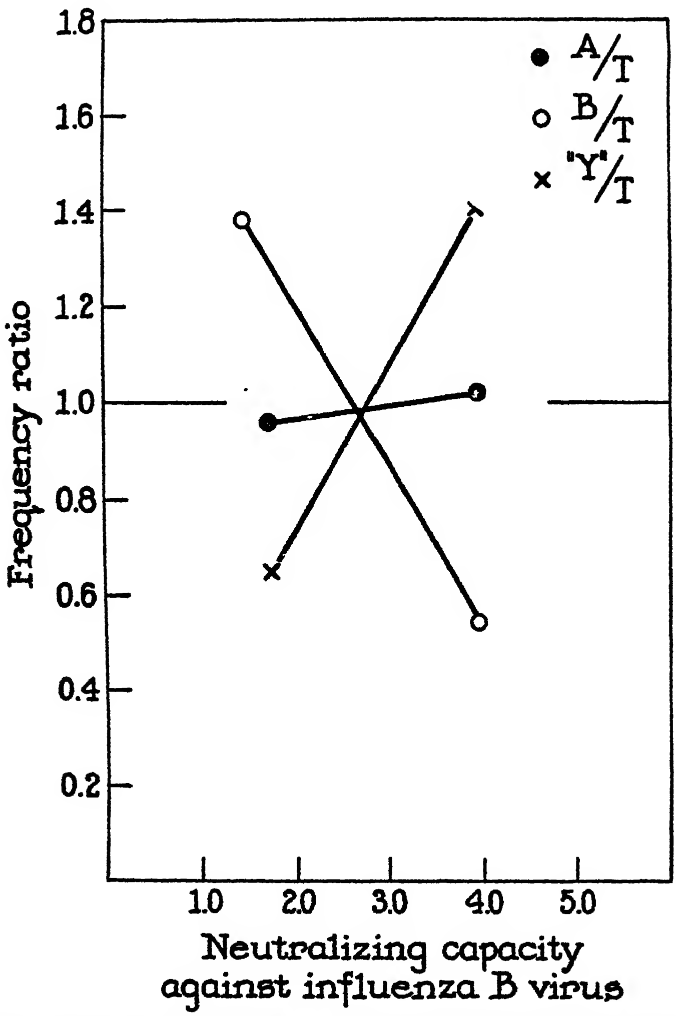


FIGURE 4.—The frequency ratios of neutralizing antibody levels against influenza B virus among cases of influenza A, influenza B, and influenza of unknown cause ("Y") relative to all cases studied.

At the present time there exists but little information as to the relative importance of the various factors which may be related to

immunity or susceptibility to influenza. The variable most readily measurable and therefore that which has been most studied is serum antibodies specifically directed against the etiological agents. Whether neutralizing antibodies against influenza A virus possessed by normal individuals are merely a partial reflection of immunity to influenza A or are directly responsible for that state has concerned a number of investigators.

A direct assessment of immunity to influenza A virus in man has been fraught with difficulties. It has become apparent that laboratory strains of the virus may possess very different degrees of pathogenicity for human beings, depending to a considerable extent upon the species in which they have been propagated and the number of passages to which they have been subjected. Andrewes, Laidlaw, and Smith (*20*) failed to infect volunteers who possessed antibodies against the agent with virus propagated in ferrets. It was shown by Burnet and Lush (*21*) and by Francis (*22*) that virus propagated for long periods in chick embryo tissue did not produce influenza after intranasal instillation in human beings even though some individuals tested possessed little or no antibodies against the agent. However, Smorodintsev et al. (*23*) reported the production of influenza in some volunteers with virus propagated in mice, and Burnet and Foley (*24*) showed that a strain recently recovered from a case of influenza A and passed only a few times in the chick embryo produced influenza in 3 of 15 inoculated individuals. In both these latter reports it was demonstrated that volunteers who contracted the experimentally induced disease had low levels of neutralizing antibodies against influenza A virus, whereas those who did not develop influenza possessed higher antibody levels. These results suggested that the level of neutralizing antibodies was of significance in determining susceptibility or immunity to influenza A in man. But the conditions under which the experimental disease was produced and the relatively large quantities of virus suspensions used seem so different from conditions encountered in the natural epidemic disease as to make comparisons between these two conditions hazardous. On the basis of studies of neutralizing antibody titers in the serum of patients with influenza A and persons in contact with these cases, Francis et al. (*11*) suggested that there was a critical level of antibodies between susceptibility and immunity to the disease. However, Rickard et al. (*3*) found that, although persons possessing serum in any of the various standard neutralizing titer ranges might contract influenza A, individuals in the lowest titer range showed attack rates considerably greater than those in the higher titer ranges.

The results presented in this paper suggest that the level of specific neutralizing antibodies against the homologous virus is one important factor in immunity to both influenza A and influenza B. That

neutralizing antibodies are not the only factor of importance in determining whether a given individual will contract one or the other disease entity in an epidemic is also evident. Even in the highest neutralizing capacity ranges encountered among normal individuals some cases of influenza occurred, although these were uncommon. Since these higher antibody levels were equal to or greater than those of numerous persons recently convalescent from either influenza A or influenza B, it seems unreasonable to assume that these concentrations of antibodies were less significant as regards immunity than those which followed these diseases themselves.

It is a surprising fact that occasional human beings may possess serum, each cubic centimeter of which is capable of neutralizing well over 20 million mouse lethal doses of influenza A virus, and still be susceptible to influenza A. It seems possible that the peculiar anatomy of the upper respiratory tract may prevent intimate contact between virus and circulating antibodies and thus permit the infectious agent to establish itself in some individuals no matter what concentration of specific antibodies may be present in the blood within adjacent capillaries. That this is not generally the case is indicated by the fact that there was a distinct tendency for both influenza A and influenza B to occur most commonly in individuals who possessed during the acute phase of their disease relatively low levels of antibodies against the homologous virus.

If, as is assumed, influenza is actually transmitted from one person to another by means of virus-containing droplets, it seems possible that individual exposure in an epidemic may be extremely variable, and whereas one person may come into contact with a small quantity of the virus another may inhale a large amount. Under these circumstances the variable quantity of the infecting agent might be partly responsible for the apparent lack of a closer correlation between immunological findings and immunity to the disease.

Possibly the concentration of the virus-inactivating agent described by Burnet, Lush, and Jackson (*25*), as well as by Francis (*26*), in the nasal secretions may also be one of the variables related to immunity or susceptibility to influenza A. As yet there does not appear to be any direct evidence available on this interesting hypothesis. Recent experiments by Francis (*27*) raise the possibility that this agent may be similar, if not identical, to neutralizing antibody. Whether the substance present in nasal secretions is also capable of inactivating influenza B virus does not seem to have been determined as yet.

The available experimental evidence (*4–7*) indicates that influenza A virus and influenza B virus do not possess a common antigenic component. Consequently, it would not be expected that high antibody levels against influenza A virus would be correlated with

immunity to influenza B or that high antibody levels against influenza B virus would be correlated with immunity to influenza A. As might have been anticipated, the distribution of antibody levels against influenza A virus of cases with influenza B was similar to that of the normal population. Conversely, the distribution of antibody levels against influenza B virus of cases with influenza A appeared to be random though in this instance the evidence is less conclusive since the normal distribution of antibodies against this agent is not known.

The results of the study of antibodies against both influenza A virus and influenza B virus in cases of influenza of unknown cause, i. e., influenza "Y," require some comment. If it is assumed that influenza "Y" is a group of etiological entities associated with infection by the hypothetical agents influenza "C" virus, "D" virus, etc., (*9*), and that each of these agents is antigenically distinct from both influenza A and B viruses, it would be reasonable to expect that there should be no correlation, either positive or negative, between antibody levels against these latter viruses and the occurrence of influenza "Y." However, it was found, very surprisingly, that the distribution of antibody levels was not entirely random in cases of influenza "Y" and this disease appeared to occur with increasing frequency as the concentration of antibodies against either of the two known influenza viruses increased.

An attempt to explain these wholly unexpected negative correlations is hazardous in the absence of direct evidence concerning the etiology of influenza "Y." At the present time it seems wise merely to record these observations and to offer no tentative hypothesis which might serve as a logical explanation for them.

SUMMARY

The level of neutralizing antibodies in the serum against the homologous virus is an important factor in determining susceptibility or resistance to influenza A and to influenza B in human beings. However, high antibody levels against influenza A virus do not diminish the frequency of influenza B nor do high antibody levels against influenza B virus reduce the incidence of influenza A. Influenza of unknown cause appears to occur with somewhat increased frequency among individuals who possess considerable concentrations of antibodies against both known influenza viruses.

REFERENCES

(*1*) Francis, T., Jr.: Am. J. Pub. Health, **27:** 211 (1937).
(*2*) Stuart-Harris, C. H., Smith, W., and Andrewes, C. H.: Lancet, **1:** 205 (1940).
(*3*) Rickard, E. R., Lennette, E. H., and Horsfall, F. L., Jr.: Pub. Health Rep., **55:** 2146 (1940).
(*4*) Magill, T. P.: Proc. Soc. Exp. Biol. and Med., **45:** 162 (1940).
(*5*) Francis, T., Jr.: Science, **92:** 405 (1940).

(6) Francis, T., Jr.: Proc. Soc. Exp. Biol. and Med., **45:** 861 (1940).
(7) Magill, T. P., and Tyndall, M.: Proc. Soc. Exp. Biol. and Med., **46:** 371 (1941).
(8) Lennette, E. H., Rickard, E. R., Hirst, G. K., and Horsfall, F. L., Jr.: The diverse etiology of epidemic influenza. Pub. Health Rep., **56:** 1777 (1941).
(9) Horsfall, F. L., Jr., Lennette, E. H., Rickard, E. R., Andrewes, C. H., Smith, W., and Stuart-Harris, C. H.: Lancet, **2:** 413 (1940).
(10) Hoyle, L., and Fairbrother, R. W.: Brit. Med. J., **1:** 655 (1937).
(11) Francis, T., Jr., Magill, T. P., Rickard, E. R., and Beck, M. D.: Am. J. Pub. Health, **27:** 1141 (1937).
(12) Horsfall, F. L., Jr., Hahn, R. G., and Rickard, E. R.: J. Clin. Invest., **19:** 379 (1940).
(13) Horsfall, F. L., Jr.: J. Exp. Med., **70:** 209 (1939).
(14) Horsfall, F. L., Jr., and Lennette, E. H.: J. Exp. Med., **73:** 327 (1941).
(15) Francis, T., Jr.: Science, **80:** 457 (1934).
(16) Horsfall, F. L., Jr.: J. Bact., **40:** 559 (1940).
(17) Reed, L. J., and Muench, H.: Am. J. Hyg., **27:** 493 (1938).
(18) Eaton, M. D., and Rickard, E. R.: Am. J. Hyg., **33:** 23 (1941).
(19) Horsfall, F. L., Jr., Lennette, E. H., and Rickard, E. R.: J. Exp. Med., **73:** 335 (1941).
(20) Andrewes, C. H., Laidlaw, P. P., and Smith, W.: Brit. J. Exp. Path., **16:** 566 (1935).
(21) Burnet, F. M., and Lush, D.: Brit. J. Exp. Path., **19:** 17 (1938).
(22) Francis, T., Jr.: Proc. Soc. Exp. Biol. and Med., **43:** 337 (1940).
(23) Smorodintsev, A. A., Tushinsky, M. D., Drobyshevskaya, A. I., Korovin, A. A., and Osetroff, A. I.: Am. J. Med. Sci., **194:** 159 (1937).
(24) Burnet, F. M., and Foley, M.: Med. J. Australia, **2:** 655 (1940).
(25) Burnet, F. M., Lush, D., and Jackson, A. V.: Brit. J. Exp. Path., **20:** 377 (1939).
(26) Francis, T., Jr.: Science, **91:** 198 (1940).
(27) Francis, T., Jr.: Problems and Trends in Virus Research, University of Pennsylvania Press, 1941.

DIURNAL VARIATION OF URINARY LEAD EXCRETION[1]

By Stewart H. Webster, *Biochemist, United States Public Health Service*

INTRODUCTION

During the latter part of 1937, when methods for the collection and preservation of blood and urine were being investigated in this laboratory, the importance of the time of collection of single urine specimens for lead determinations was not generally realized. Accordingly, a study was begun in this laboratory to determine whether or not all urine samples collected from one individual during the day would show the same lead concentration.

Following the discovery of a marked diurnal variation in this individual the work was repeated on the same subject at a different time of year and later extended to include 6 other persons.

DIURNAL VARIATION

It has long been known that, for the common constituents, the composition of urine excreted by a given individual may fluctuate considerably during a 24-hour period. Nearly a century ago Bence-Jones was among the first (*1*) to observe a decrease in the acidity of urine

[1] From the Division of Industrial Hygiene, National Institute of Health.

following meals. This author also made observations regarding variations in phosphate and uric acid excretion and in a later publication (*2*) referred to the diurnal variation in the acidity of the urine. Roberts (*3*) in 1859 was apparently the first (*4*) to use the term "alkaline tide" for the decrease in the acidity of urine after meals. Both authors referred to titratable acidity rather than to changes in pH.

Although common agreement has not been reached regarding the causes of this phenomenon, the widespread existence of diurnal variation has been shown for a number of important urinary constituents, such as phosphate (*5*), urea (*6*), uric acid (*7*), and chloride (*8*).

Quite apart from the theoretical explanations, the practical result of the recognition of this change in composition has been the common use of morning or 24-hour specimens rather than single short-time specimens in order to minimize this variability and to secure a more representative sample.

When the determination of the lead content of urine specimens first became a common procedure comparatively large volumes were needed in order to measure the lead quantitatively. Analyses were therefore usually confined to samples collected for 24 hours or longer.

With the refinement of analytical methods the sensitivity increased to such an extent that smaller quantities of urine could be used. Indeed, with the development of the dithizone method for lead detection, the quantities could be reduced from 1,000 or 2,000 cc. to 100 or 200 cc. Use of even smaller amounts was advocated by some (*9*, *25*).

This reduction in sample size had an obvious advantage as far as time and effort in the collection of samples were concerned. Usually a single voiding sufficed to give enough material for one or more analyses. In industrial studies it is usually impracticable to collect 24-hour specimens on a large group of individuals. This is due to several factors such as danger of contamination of the samples, the inconvenience to the subjects, and the uncertainty that the entire 24-hour output had been saved.

For these reasons the common method has been to collect single specimens at the time of day most convenient for the subject, usually at the time of the physical examination. This was the plan adopted in the study of the lead storage battery industry (*10*).

On the other hand, the wide variation in daily urine output for different individuals is a well known fact. It is also recognized that children and adults differ in regard to urine volumes (*11*, *12*). Even an average value for males may not hold for females (*13*). The total volume depends on the temperature, humidity, muscular effort, perspiration, and water consumption, as well as other physiological and psychic factors.

410619°—41——2

With essentially normal individuals this quantity may commonly vary from 800–1,500 cc. (*14*) to 1,000–1,800 cc. (*12*) daily, and urine volumes for a given individual may also vary widely from day to day and from hour to hour (*14*). In order to increase diagnostic significance, therefore, samples taken over large time intervals are desirable, since interpretations made on the basis of analyses of single specimens may be faulty. Information concerning the total output of lead during a 24-hour period is consequently of more value than the concentration for a single specimen in terms of milligrams of lead per liter.

In the collection of urine specimens for the lead arsenate spray residue study (*15*) a compromise was effected. Since it appeared that the first morning specimen was a more representative sample of the day's output, because it was collected over a longer period of time, it was decided to take morning specimens in most cases and to supplement these with some 24-hour and short-time specimens.

The purpose of the following investigation was to secure information regarding the range in composition of urine specimens collected from given individuals during the entire day. While the chief interest was in the lead content, data about other important urinary constituents, such as phosphorus and arsenic, were also sought. In addition, it was hoped to determine whether any variation in the blood occurred simultaneously with or independently of urine changes.

EXPERIMENTAL PROCEDURE

Four healthy adult male orchardists having 25 to 30 years of orchard experience were chosen from the Wenatchee group of individuals included in the lead arsenate spray residue study (*15*). In addition, three healthy adult males, classed as consumers, having no known exposure to lead arsenate, were selected from the personnel of the laboratories of the Division of Industrial Hygiene, National Institute of Health.

From these seven individuals the total urinary output was collected in separate lead- and arsenic-free containers at each voiding during 3- or 4-day periods and a total of 189 specimens was secured. The same procedure was used as that employed in the earlier studies (*10, 15*). In addition, blood specimens were taken three times a day on two alternate days from two of the consumers. The number of urine specimens collected from any one person during a 24-hour period varied from 4 to 10, the average for all subjects being 6.4 specimens per day. Since no attempt was made to collect the specimens at regular periods, the time interval between samples varied greatly, these intervals ranging from three-fourths of an hour to 10 hours, with an average of 3.9 hours for a 24-hour period.

Data were obtained on four series for consumers and three for orchardists; 100 cc. specimens of urine were taken for lead determination

whenever possible. For smaller samples urine from two adjacent intervals was combined. The pH and the volume were determined on all and specific gravity and phosphate measurements on all but two series. The importance of chloride and calcium determinations was not sufficient to justify making a larger number of these measurements. Where sufficient volume permitted, arsenic determinations were also made.[2]

From the analytical data could be calculated urinary lead in terms of concentration (in milligrams per liter), rate of excretion (in micrograms per hour), and total quantity (in milligrams). Similar data were obtained for urinary phosphate measurements. By successively plotting these quantities, one at a time, against other factors, such as time, pH, specific gravity, water output, etc., it was possible to study the relation between these various factors.

Space does not permit giving the individual values for the thousand-odd determinations made during this study. Instead, most of these have been incorporated, together with other calculated quantities, in a series of seven figures showing in graphic form the variation of these various measurements with time (figs. 1–6).

This was done for a given person by plotting a set of values, such as urinary lead concentrations, against the time of day and connecting these points with straight lines. One graph was made for each kind of measurement. It will be noted that there are three parts to each figure, dealing with concentration values, rates of excretion, and total amounts (output). Specific gravity and pH values are included in the section on concentrations since these values are related to the salt concentration and hydrogen-ion concentration, respectively. Each figure, therefore, summarizes the data for one of the experimental subjects.

Table 1 indicates some of the information regarding the experiment and relates the figures to the corresponding subjects.

TABLE 1.—*Information concerning experimental subjects*

Subject No.	Figure in which data is shown	Class of individuals	Date of starting experiment	Location of subject	Period of experiment (days)
1A	1A	Consumers (with no known exposure to lead arsenate).	Aug. 24, 1937	Washington, D. C.	3
1B	1B		Oct. 11, 1938	do.	4
2	2		Mar. 25, 1940	do.	3
3	3		do.	do.	3
4	4	Orchardists (with some exposure to lead arsenate).	Jan. 16, 1939	Wenatchee, Wash.	3
5	5		Dec. 16, 1938	do.	3
6	6		Feb. 6, 1939	do.	3

[2] Lead was determined by a photometric dithizone method (*10, 15*), arsenic by the Gutzeit method (*10, 15*), phosphate by a modification of the Leconte uranium acetate method (*16, 17*), chloride by the Arnold modification of the Volhard procedure (*18, 19*), and calcium by titration with potassium permanganate based on McCrudden's method (*20, 21*). The pH of urine specimens was determined colorimetrically (*10*).

Inspection of the graphs has yielded much valuable information. From such considerations the most significant results will be discussed.[3]

VARIATION OF URINARY LEAD CONCENTRATIONS

The first important point disclosed was that for all of the seven individuals studied the urinary lead concentration of single specimens

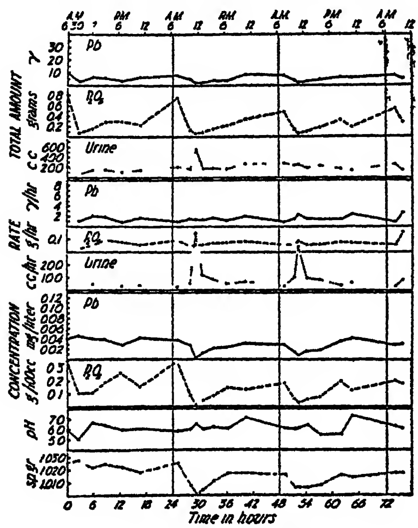


FIGURE 3.—Subject 3.

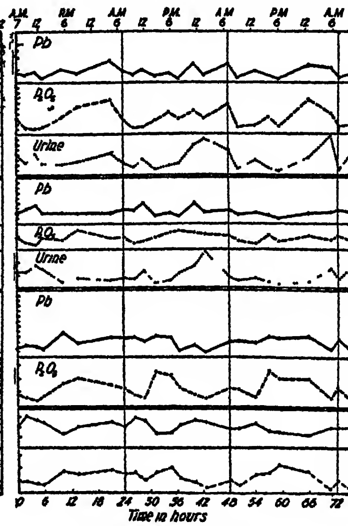


FIGURE 2.—Subject 2.

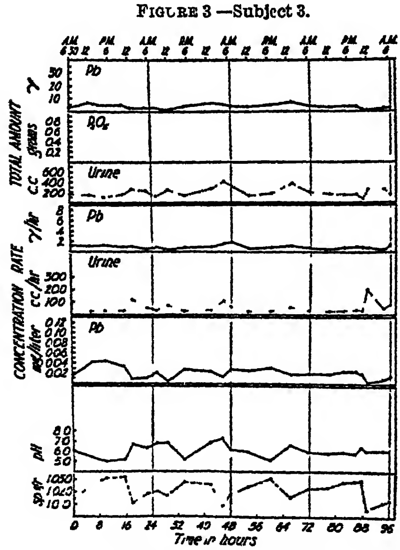


FIGURE 1B.—Subject 1B.

FIGURE 1A.—Subject 1A.

Urinary diurnal variation for 3 laboratory subjects.

varied greatly during the 24 hours of the day. During the 3- or 4-day periods the consumers had a range of 0.003 to 0.060 mg. per liter and

[3] In figures 1–6 corresponding graphs will be discussed in order reading from the bottom upward.

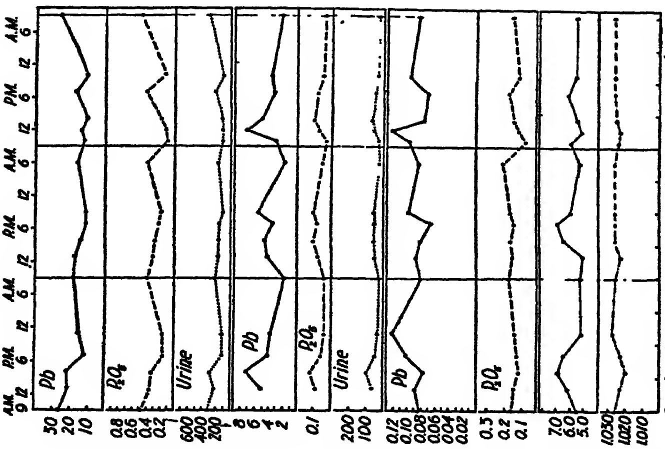


FIGURE 4.—Subject 4.

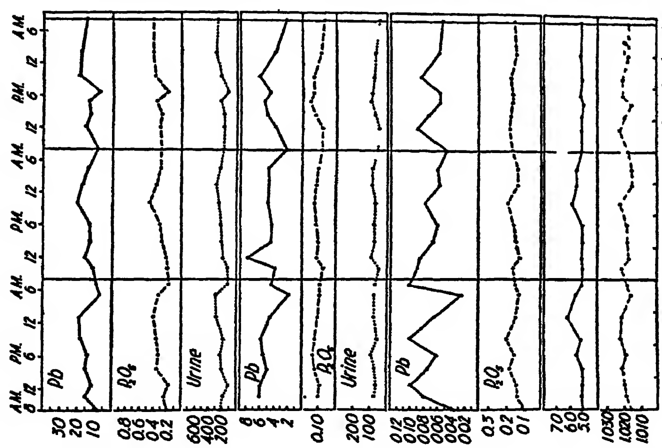


FIGURE 5.—Subject 5.

Urinary diurnal variation for 3 orchardists.

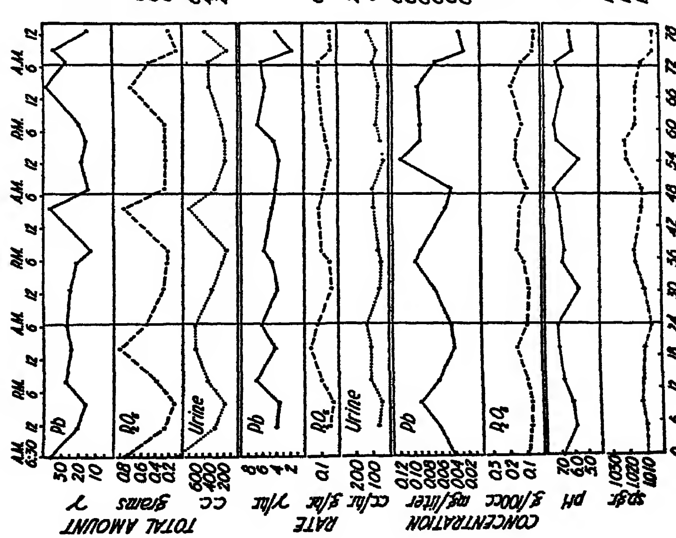


FIGURE 6.—Subject 6.

the orchardists a range of 0.025 to 0.124 mg. per liter. The greatest variation in a single day was from 0.017 to 0.060 mg. per liter for a consumer and from 0.025 to 0.101 for an orchardist.

Analyses of duplicate 100 cc. samples indicated a high degree of reproducibility for the lead determinations, usually within ±0.003 mg. per liter. This clearly showed that the variation which was taking place was much greater than the experimental error of the determination.

The cyclic nature of the curves was evident and the recurrence of high and low points at approximately the same time of day was noted. (This is especially true in fig. 1A.) However, occasional minor peaks and troughs broke this regularity in nearly all of the subjects. Ninety-five percent of the time a peak concentration was found to occur between 4 p. m. and midnight, the average time being 7 p. m. No particular regularity was discovered for the other high points. While minimal values for a given individual showed considerable regularity there was no uniformity in time of such occurrences for the whole group since they were found throughout the 24 hours. It is also of interest to note that the variations in lead concentrations for individuals with low lead output were less than for those with higher lead levels.

A second finding was the inverse correspondence between these lead concentrations and pH values of the urine. This was most evident in the first case studied (fig. 1A) in which the most acid urines (those with lowest pH values) occurred at the times of maximal lead concentrations (4–6 p. m.).

Very little correspondence was noted between lead concentrations and corresponding phosphate concentration values (calculated as P_2O_5) and little between the latter and corresponding pH values.

The most pronounced relation was found for pH and specific gravity values. This inverse correspondence was noted particularly with the first subject (fig. 1B). It is likewise of interest to note the general parallelism for the lead concentration and specific gravity curves for this same person. Finally, the general inverse correspondence between rates of urine excretion and specific gravity values was evident in all the subjects, but particularly so for subject 1B.

VARIATION IN RATE OF URINARY LEAD EXCRETION

For all of the individuals studied a great variation in rate of urinary lead excretion (expressed in micrograms of lead per hour) was found. Table 2 shows the extreme values for the rates of each individual for each day of the experiment. For comparison, the extreme values are also given for concentration values for the same persons during the experimental period. The two sets of values do not necessarily

correspond to the same samples since concentration and rate are not directly related. For example, a specimen with a minimum concentration value would not necessarily show the minimum rate.

The rates for consumers ranged from 0.3 to 4.1 micrograms per hour and for orchardists from 1.8 to 7.8 micrograms per hour, the average rates for the whole period being 1.5 and 4.6 micrograms of lead per hour for consumers and orchardists, respectively.

TABLE 2.—*Daily variation in concentration and rate of urinary lead excretion for each individual during 3- or 4-day periods*

Subject No.	Range in urinary lead concentration (milligrams per liter)				Range in urinary lead rate (micrograms per hour)			
	First day	Second day	Third day	Fourth day	First day	Second day	Third day	Fourth day
1A	0 017	0 010	0 015	----------	0.7	0 8	0.8	----------
	.060	.046	.058	----------	3.2	1.5	3 0	----------
1B	009	004	.019	0 004	.5	.3	.6	0.4
	.044	.029	.032	.026	1.2	1.8	1.2	1.3
2	.015	008	.015	----------	2.1	1 5	1.1	----------
	.048	.041	.041	----------	3.6	4 1	2 6	----------
3	.028	.003	.007	----------	.9	.9	.8	----------
	.046	.032	.041	----------	2.1	2.0	2.4	----------
4	.076	.066	.072	----------	1.8	1.8	2.3	----------
	.122	.098	.124	----------	7.2	5.6	7.2	----------
5	.025	.045	.053	----------	1.8	2.3	2.4	----------
	.101	.089	.090	----------	6 0	7.8	6.3	----------
6	.040	.043	067	----------	3.6	3.8	3.6	----------
	.088	.097	.117	----------	7.0	5.9	6.7	----------

The graphs in figures 1–6 showing the variations in rate of lead output do not support the contention of Barnes (*22*) regarding the essential constancy of rates of lead excretion for any given individual.

It is evident from the data in table 2 that attempts made to judge the extent of lead absorption in terms of how much lead is being excreted per hour may lead to erroneous conclusions when based on short-time samples. Nor is it safe to make individual comparisons of urinary lead concentrations on single specimens unless additional information is at hand.

For several of the subjects the rate of lead excretion (in micrograms per hour) was directly related to the rate of urine excretion (in cubic centimeters per hour) for those samples in which the specific gravity was greater than 1.010. Also, marked water diuresis did not greatly increase the rate of lead excretion nor the total amount.

This relationship is shown for the various subjects in figure 7, in which the urinary lead rates are plotted against rates of urine excretion. The lines shown are lines of regression obtained by the least square method for points corresponding to samples with specific gravity values of 1.011 and over. The limited scattering of the values can

be seen to hold quite generally except for the values with low specific gravities.

A similarity in form of the phosphate rate curves and urinary rate curves was noted. This was especially marked in figure 6. It is possible that the same influences which affect the excretion of lead also control the excretion of phosphorus.

The rate of urine excretion was found to vary widely. The two pronounced humps in the curve of urine excretion in figure 3 were caused by the subject deliberately drinking considerable quantities of water.

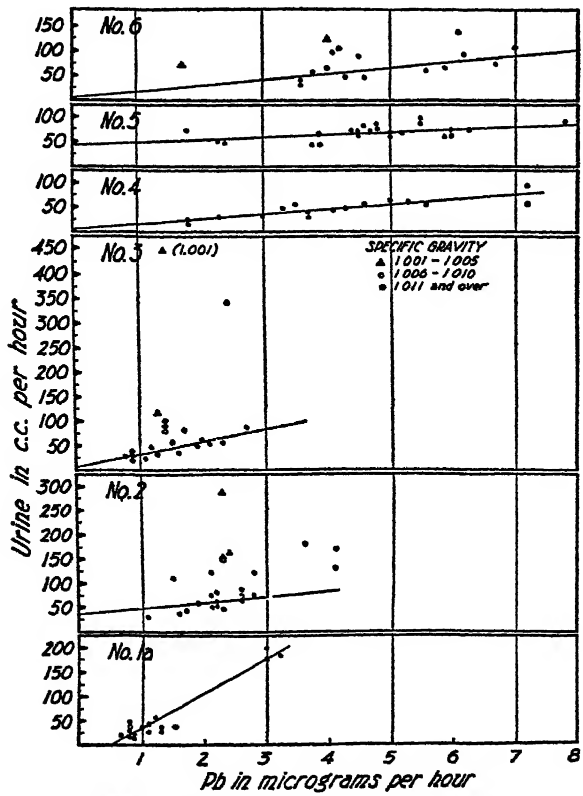


FIGURE 7.—Urinary lead rates and rates of urine excretion for 6 individuals. (Lines of regression were computed for specimens with a specific gravity in excess of 1.010.)

TOTAL URINARY OUTPUT

One of the facts disclosed by the computations was that in spite of wide variations in concentration and rate during the 3-day period, the total quantities of lead excreted from day to day by given individuals did not vary greatly in amount. This is shown in table 3 which gives the calculated 24-hour output of urinary lead as well as P_2O_5. The remarkable constancy of daily urinary lead output for given

individuals seems to be independent of excretion levels since it occurs in both consumers and orchardists alike.

For a given individual an increase in the amount of urinary phosphorus (calculated as P_2O_5) per sample was usually accompanied by an increase in the quantity of lead excreted (fig. 2).

These independent measurements have confirmed the phenomenon of diurnal variation of urinary lead excretion and suggest that the excretion of phosphorus and lead are chemically related. While the outputs of these two appear to be thus related, the ratio between total P_2O_5 and total Pb differs for different individuals. A given phosphate output is presumably dependent largely on the phosphate content of the diet and is therefore not associated with any fixed quantity of lead. Table 3 indicates that although the P_2O_5 output for both the consumers and orchardists fell into normal ranges, a given P_2O_5 output did not correspond to any fixed quantity of lead.

As might be expected no fixed relation was found between the quantity of lead in a specimen and the size of the single specimen for a given individual. The parallelism between the curves for total P_2O_5 output and total urine output was better and is shown especially in figure 6. In addition a few cases were noted (figs. 1A, 1B, and 6) in which an inverse relation was shown between lead concentrations and volume of water excreted.

TABLE 3.—*Total daily urinary output*

Class and subject No.	Lead (milligrams)				P_2O_5 (grams)		
	First day	Second day	Third day	Fourth day	First day	Second day	Third day
Personnel of Division of Industrial Hygiene:							
1A	0.026	0.026	0.026				
1B	.020	.023	.020	0.017			
2	.060	.064	.048		2.2	2.6	2.0
3	.032	.032	.032		1.8	1.5	1.5
Orchardists:							
4	.088	.081	.052		1.5	1.5	1.4
5	.11	.11	.10		2.4	2.5	2.4
6	.12	.11	.12		2.2	1.9	2.1

BLOOD LEAD MEASUREMENTS

Blood was drawn from two of the consumers (Nos. 2 and 3) on six occasions, using the technique for sampling and analysis previously described (*10, 15*). While these samples were not numerous it was hoped that they might shed some light on the important relation between urinary and blood lead values. Table 4 indicates the values found, together with urine concentrations for specimens collected at nearly the same time.

TABLE 4.—*Comparison of blood and urinary lead concentration values for 2 subjects with no known exposure to lead arsenate*

Time	Subject No. 2		Subject No. 3	
	Urine (mg. per liter)	Blood (mg. per 100 g.)	Urine (mg. per liter)	Blood (mg. per 100 g.)
9:00 a. m.	0.023	0.081	0.046	0.045
12.30 p. m.	.015	.030	.040	.024
3:45 p. m.	.048	.033	.038	.031
9:00 a. m.	.032	.060	.014	.028
12:45 p. m.	.028	.055	.015	.031
3:45 p. m.	.040	.036	.017	.023

The random character of the blood values and lack of correspondence with the urine values is apparent. Moreover, no relation could be found between the blood values and other quantities. However, it will be noted that the initial blood values (ca. 9 a. m.) were always higher than the final values (at 3:45 p. m.). This is in agreement with Schmitt and Basse (*23*) who found that the first morning (fasting) blood specimens showed higher values than other samples taken throughout the day. Their observation that profound increase in water consumption with a corresponding diuretic effect caused a great temporary increase in blood lead values, together with the usually observed high initial values in the morning, may serve to explain the wide range of blood values frequently exhibited in given individuals within relatively short intervals of time.

While the blood lead measurements made in the present study are not extensive enough to establish the presence of diurnal variation, the results are in agreement with this view.

DIURNAL VARIATION OF URINARY ARSENIC EXCRETION

The amount of urine available after portions had been taken for lead and other determinations was frequently insufficient for arsenic analysis. However, the existence of diurnal variation in urinary arsenic excretion was found in three individuals [4] for whom specimens were available. One of the consumers with the most complete data showed a range in urinary arsenic excretion from 1.2 to 3.6 micrograms per hour with an average value of 2.0. The orchardist showed a range of 6.1 to 19.5 and an average of 11.4 micrograms per hour. The corresponding rates for urinary lead excretion were 2.6 and 5.1 micrograms per hour.

The data for these two individuals were not complete enough to enable the daily outputs of arsenic to be calculated. However, no relation was found between the arsenic and lead values. It is evident that the factors controlling the excretion of lead differ from those influencing the elimination of arsenic.

[4] Two consumers and one orchardist.

RELATION BETWEEN SINGLE URINE SAMPLES AND 24-HOUR SPECIMENS

It is evident from the foregoing discussion that diurnal variations of considerable magnitudes occur regularly both in those exposed and those not exposed to lead arsenate. Since neither concentrations, rates, nor outputs are constant from interval to interval it is difficult to determine an average value which will approximate that obtained with a 24-hour sample. The average of a number of samples collected during a day will approximate this result but will entail much more work for the analyses.

The first morning specimen appears to have considerable value in this connection. Table 6 gives a comparison of the lead concentrations of first morning specimens and the corresponding concentrations of calculated 24-hour samples.[5] It can be seen that the agreement between the averages for the 22 values was quite close, large deviations between the two kinds of measurements did not frequently occur, and the agreement was better for low lead levels than for higher ones.

TABLE 6.—*Comparison of urinary lead concentration values for first morning specimens and corresponding 24-hour specimens for two groups of persons*

Class and subject No.	Day	Pb concentration, first morning specimens	24-hour specimens (mg. per liter)	Difference
Consumers (personnel of Division of Industrial Hygiene):				
1A	First	0.022	0.027	0.005
	Second	.025	.031	.006
	Third	.018	.024	.006
1B	First	.010	.023	.013
	Second	.029	.017	.012
	Third	.020	.023	.003
	Fourth	.015	.014	.001
2	First	.037	.030	.007
	Second	.030	.023	.007
	Third	.035	.027	.008
3	First	.036	.038	.002
	Second	.029	.018	.011
	Third	.029	.021	.008
Average for class		.026	.024	.007
Orchardists (residents of Wenatchee, Wash.):				
4	First	.081	.089	.008
	Second	.084	.085	.001
	Third	.084	.087	.003
5	First	.101	.067	.034
	Second	.045	.067	.022
	Third	.053	.066	.013
6	First	.044	.053	.009
	Second	.043	.062	.019
	Third	.067	.087	.020
Average for class		.067	.074	.014

[5] The average concentration for the 24-hour period was obtained by adding together the amounts of lead in each sample collected during the 24 hours and dividing by the total 24-hour volume in liters.

The most important urinary lead measurement is the total amount excreted during a 24-hour period, since from this value can be calculated the corresponding concentration and the rate of excretion. The total amount may be obtained in one of two ways, either by analyzing the combined 24-hour output, or by analyzing all of the separate urine specimens excreted during this time. Except for research purposes, only the first method had practical value.

It is evident that comparisons of individual outputs may be useful in evaluating the degree of lead absorption. The amounts of lead excreted in the urine during 24-hour periods may therefore be compared for individuals or for groups of individuals.

The situation is quite different, however, for fractional day samples. It has been shown for six individuals that single specimens taken at random during the 24 hours may lead to widely differing analytical results. Comparison of individual concentration values thus obtained may have little significance since there is no fixed ratio of urinary lead concentration to total output. In the absence of 24-hour urine volumes, therefore, it is impossible to determine the total quantities excreted.

It has also been shown for the cases studied that by taking the first morning specimens the phenomenon of diurnal variation was minimized and in most cases the first morning specimens were representative samples of the corresponding 24-hour specimens. The concentration values thus obtained are therefore comparable for individual or group measurements. However, unless the 24-hour urine volumes have been measured the total lead outputs cannot be determined. Since the latter vary greatly, determination of the lead concentrations of urine samples from two individuals cannot be used to establish their 24-hour outputs.

In a subsequent study (*24*) the application of an average value for the 24-hour urine volume to concentration measurements for groups of individuals will be shown.

SUMMARY AND CONCLUSIONS

The occurrence of diurnal variation in urinary lead excretion has been demonstrated in the six cases studied. This phenomenon appears to take place independent of previous exposure of the individual or time of year.

A wide daily variation was shown for urinary lead concentration measurements as well as for the rate of lead excretion (in micrograms per hour) and for the total volume with all of the individuals studied. However, the total daily urinary lead outputs were remarkably constant for any one individual.

Relations were sought between various lead and phosphate measurements as well as with pH, specific gravity, and urine volume deter-

minations. A number of trends were found. An increase in the rate of urine excretion was generally paralleled by an increase in the rate of lead excretion for those specimens whose specific gravity was greater than 1.010. Marked diuresis was found not to increase greatly the rate of lead excretion nor the total quantity.

For a given individual an increase in the amount of urinary phosphorus (as P_2O_5) per sample was usually accompanied by an increase in the quantity of lead excreted. These independent measurements have confirmed the diurnal variation of urinary lead excretion and suggest that the excretion of lead and phosphorus are chemically related.

The determination of 12 blood lead values disclosed that the morning values were higher than the corresponding afternoon quantities. No relation between the blood lead values and other factors was apparent.

First morning specimens have been shown to be representative samples of the corresponding 24-hour specimens. The limitation of the fractional-day samples, that they give no measure of the total daily outputs, has been indicated.

Neither the urinary lead concentrations nor the rate of urinary lead excretion can be used as a measure of lead absorption when they are based on short-time measurements. The total 24-hour urinary lead output has more significance than any other measure of lead made on fractional-day samples.

ACKNOWLEDGMENTS

It is a pleasure to acknowledge the helpful suggestions of Principal Industrial Toxicologist Lawrence T. Fairhall throughout this investigation. I am indebted also to the following for assistance: Passed Assistant Surgeon Harold T. Castberg for securing the blood and urine specimens and for drawing the curves, Assistant Scientific Aide Stuart W. Jones for assistance with the arsenic analyses, Assistant Chemist William F. Knop for help with the lead analyses, Junior Chemist Frances L. Hyslop for assistance with the lead and other determinations and help in preparing the manuscript, and especially Surgeon Paul A. Neal and Passed Assistant Surgeon Waldemar C. Dreessen and those unnamed donors for their invaluable contributions to this study.

REFERENCES

(*1*) Bence-Jones, H.: Contributions to the chemistry of urine. On the variations in the alkaline and earthy phosphates in the healthy state, and on the alkalescence of the urine from fixed alkalis. Phil. Trans. Roy. Soc. Lond., **135**: 335–349 (1845).

(*2*) Bence-Jones, H.: Contributions to the chemistry of urine. Part I. On the variations of the acidity of the urine in the state of health. Part II. On the simultaneous variations of the amount of uric acid and the acidity of urine in the healthy state. Ibid., **139**: 235–260 (1849).

(*3*) Roberts, Wm.: Observations on some of the daily changes in urine. Edin. Med. J., **5**: 817–825, 906–923 (1859–60).

(*4*) Brunton, C. E.: The acid output of the kidney and the so-called alkaline tide. Physiol. Rev., **13**: 372–399 (1933).

(5) Fiske, C. H.: Inorganic phosphate and acid excretion in the post-absorptive period. J. Biol. Chem., 49: 171–181 (1921).
(6) MacKay, E. M.: Studies of urea excretion: The diurnal variation of urea excretion in normal individuals and patients with Bright's disease. J. Clin. Invest., 6: 505–516 (1928).
(7) Cathcart, E. P., Kennaway, E. L., and Leathes, J. B.: On the origin of endogenous uric acid. Quart. J. Med., 1: 416–447 (1907–08).
(8) Simpson, G. E.: Diurnal variations in the rate of urine excretion for two-hour intervals: Some associated factors. J. Biol. Chem., 59: 107–122 (1924).
(9) Shiels, D. O.: A rapid simple method for the determination of lead in small quantities in the urine. J. Ind. Hyg., 20: 581–588 (1938).
(10) Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Page, R. T., Webster, S. H., Armstrong, D. W., and Sayers, R. R.: The control of the lead hazard in the storage battery industry. Public Health Bull. 262. Government Printing Office, 1941.
(11) Holt, L. E., and McIntosh, R.: Holt's Diseases of Infancy and Childhood. Appleton-Century Co., 1936. Page 639.
(12) Best, C. H., and Taylor, N. B.: The Physiological Basis of Medical Practice. Wm. Wood and Co., 1937. Page 623.
(13) Hammarsten, O.: Lehrbuch der physiologischen Chemie. 11th ed. Bergmann, Munich, 1926. Page 608.
(14) Shohl, A. T.: Mineral Metabolism. Reinhold, 1939. Page 76.
(15) Neal, P. A., Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Webster, S. H., Castberg, H. T., and Fairhall, L. T.: A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bull. 267. Government Printing Office, 1941.
(16) Leconte, Ch.: Recherches sur l'analyse qualitative et quantitative de l'acide phosphorique. Comp. Rend., 29: (No. 2) 55–56 (1849).
(17) Hawk, P. B., and Bergeim, O.: Practical Physiological Chemistry. 10th ed. Blakiston, 1931. Page 876.
(18) Arnold, C.: Kurze Methode zur massanalytischen Bestimmung der Chloride im Harn. Z. f. physiol. Chem., 5: 81–93 (1881).
(19) Hawk, P. B., and Bergeim, O.: Ibid., page 879.
(20) McCrudden, F. H.: The determination of calcium in the presence of magnesium and phosphate: The determination of calcium in urine. J. Biol. Chem., 10: 187–199 (1911).
(21) Bray, W. E.: Synopsis of clinical laboratory methods. Mosby, 1936. Page 51.
(22) Barnes, E. C.: Possibilities of control of lead exposure by examining less than 24-hour urine samples. J. Ind. Hyg., 21: 464–468 (1939).
(23) Schmitt, F., and Basse, W.: Tagesschwankungen der Mineralbewegung zwischen Plasma und Erythrocyten, beobachtet bei Blei, Calcium und Phosphor an Gesunden unter verschiedenen Versuchsbedingungen. Bleigehalt der Galle. Deut. Arch. f. klin. Med., 182: 193–199 (1938).
(24) Webster, S. H.: 24-hour output of certain urinary constituents in persons exposed to lead arsenate spray residue. Pub. Health Rep., in press.
(25) Meek, S. F., Collins, G. R., and Harrold, G. C.: Correlation coefficient between basophilic aggregation test and lead in urine. J. Ind. Hyg., 22: 401–407 (1940).

FREQUENCY OF DISABLING MORBIDITY BY CAUSE, AND DURATION, AMONG MALE AND FEMALE INDUSTRIAL WORKERS DURING 1940, AND BY CAUSE AMONG MALES DURING THE FIRST QUARTER OF 1941[1]

By William M. Gafafer, *Senior Statistician, United States Public Health Service*

The quarterly reports for the year 1940 on the frequency of sickness and nonindustrial injuries causing disability for 8 consecutive calendar days or longer among a group of approximately 200,000 male members of 26 industrial sick benefit organizations have appeared (*1–4*). The present report records the experience among both males and females for the year 1940, and among males for the first quarter of 1941.

[1] From the Division of Industrial Hygiene, National Institute of Health.

The last report of the series referring to the experience among females appeared in 1940 (*1*).

The year 1940.—Table 1 shows the experiences for males and females for 1940, with comparative data for earlier years. In a comparison of the frequencies for males during 1940 with the corresponding frequencies for 1935–39 the following differences are of interest: the 21 percent increase in bronchitis, the 38 percent increase in pneumonia, and the 22 percent increase in appendicitis.

A comparison of the frequencies for females for the same time periods shows over a 50 percent decrease for diseases of the stomach,

TABLE 1.—*Frequency of cases of sickness and nonindustrial injuries lasting 8 consecutive calendar days or longer among male and female employees in various industries, by cause, experience of 1940 and 1939, and the 5 years, 1935–39*

Cause (numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of cases per 1,000 persons					
	Males			Females		
	1940	1935–39 [1]	1939	1940	1935–39 [1]	1939
Sickness and nonindustrial injuries [2]	96.4	89.3	89.0	153.3	144.3	150.0
Percent of female rate	*63*	*62*	*59*			
Percent of male rate				*159*	*162*	*169*
Nonindustrial injuries (169–195)	11.8	11.2	10.3	14.0	13.0	13.0
Sickness [2]	84.6	78.1	78.7	139.3	131.3	137.0
Respiratory diseases	37.7	32.8	33.9	63.5	57.7	63.9
Influenza and grippe (33)	17.5	15.2	16.6	27.7	26.0	29.9
Bronchitis, acute and chronic (106)	5.2	4.3	4.1	8.2	7.3	7.3
Diseases of the pharynx and tonsils (part of 115)	4.9	4.8	4.4	12.7	12.3	11.6
Pneumonia, all forms (107–109)	3.6	2.6	3.0	1.8	1.5	2.0
Tuberculosis of the respiratory system (13)	.7	.8	.7	.6	.8	.9
Other respiratory diseases (104, 105, 110–114)	5.8	5.1	5.1	12.5	9.8	12.2
Nonrespiratory diseases	44.8	43.0	42.8	71.8	69.0	68.4
Digestive diseases	14.4	13.4	13.4	21.7	22.8	21.5
Diseases of the stomach, except cancer (117, 118)	3.9	3.8	3.5	1.2	2.6	2.2
Diarrhea and enteritis (120)	1.4	1.2	1.2	2.4	2.4	1.6
Appendicitis (121)	5.0	4.1	4.3	12.1	11.6	11.9
Hernia (part of 122)	1.5	1.6	1.5	.3	.5	.5
Other digestive diseases (part of 115 and 122, 116, 123–129)	2.6	2.7	2.9	5.7	5.7	5.3
Nondigestive diseases	30.4	29.6	29.4	50.1	46.2	46.9
Diseases of the heart (90–95)	2.9	2.5	2.9	2.7	1.5	1.8
Other circulatory diseases (96–103)	3.7	3.2	2.5	2.6	3.1	3.2
Nephritis, acute and chronic (130–132)	.4	.5	.4	.6	.4	.5
Other genitourinary diseases (133–139)	2.7	2.4	2.3	10.2	9.6	9.5
Neuralgia, neuritis, sciatica (part of 87)	2.3	2.2	2.2	2.6	2.1	2.1
Neurasthenia and the like (part of 84)	1.1	1.1	.9	5.4	5.9	5.7
Other diseases of the nervous system (80–83, 85, part of 84 and 87)	1.0	1.1	1.1	1.5	.8	1.2
Rheumatism, acute and chronic (58, 59)	4.0	3.9	3.5	3.1	3.1	2.4
Diseases of the organs of locomotion, except diseases of the joints (part of 156)	2.8	2.8	2.6	2.2	1.7	1.4
Diseases of the skin (151–153)	2.8	2.9	2.7	3.4	3.1	3.3
Infectious and parasitic diseases [3] (1–12, 14–24, 26–29, 31, 32, 34–44)	1.8	2.4	2.1	2.6	3.5	2.3
Cancer, all sites (45–55)	.6	.5	.6	.5	.5	.5
All other diseases (56, 57, 60–79, 88, 89, 140–150, 154, 155, 157, 162 (part of 156)	4.3	4.1	4.6	12.7	10.9	13.0
Ill-defined and unknown causes (200)	2.1	2.3	2.0	4.0	4.6	4.7
Number of person-years, all reporting organizations	216,621	896,606	188,595	16,318	77,697	15,343
Number of organizations	29		29	24		24

[1] Average of the 5 annual rates.
[2] Industrial injuries, venereal diseases, and a few numerically unimportant causes of disability are not reported.
[3] Except influenza, respiratory tuberculosis, and the venereal diseases.

except cancer, the 1940 rate being 1.2 cases per 1,000 while the rate for 1935–39 is 2.6. The average annual rate for this group of causes for the 9 years, 1932–40, is 2.8, the year 1940 yielding the lowest rate.

It will be observed that, while the total frequency for 1940, 1939, or 1935–39 is from 60 to 70 percent greater among the females than among the males, there are certain causes and cause groups that show for each of the 3 time periods lower rates among the females; these are pneumonia, diseases of the stomach except cancer, hernia, diseases of the heart, and rheumatism.[2]

TABLE 2.—*Frequency of ended cases of sickness and nonindustrial injuries disabling for the indicated number of consecutive calendar days, t, or more, male and female employees in various industries,[1] by broad cause group, cases beginning during the year 1940 and lasting at least 8 consecutive calendar days*

t days	Number of person-years of membership	Annual number of cases per 1,000 persons disabling for *t* days or more					
		Sickness and nonindustrial injuries	Respiratory diseases	Digestive diseases	Nonrespiratory nondigestive diseases	Ill-defined and unknown causes	Nonindustrial injuries
		Males					
8	85,566	103.5	40.5	16.8	33.5	1.3	11.4
15	85,566	65.1	18.6	13.8	24.1	1.0	7.6
22	85,566	47.5	10.9	11.9	18.4	.8	5.5
29	85,566	37.3	7.5	9.9	14.7	.6	4.6
36	85,566	30.0	5.7	8.0	12.1	.4	3.8
43	85,566	24.2	4.4	6.2	10.4	.3	2.9
50	85,566	19.7	3.4	4.8	8.9	.3	2.3
57	83,317	16.4	2.8	3.7	7.9	.2	1.8
64	82,740	13.9	2.2	2.9	7.2	.2	1.4
71	82,740	11.9	1.9	2.2	6.4	.2	1.2
78	72,539	10.8	1.9	1.9	5.9	.1	1.0
85	72,539	9.6	1.7	1.5	5.4	.1	.9
92	66,368	8.1	1.4	1.1	4.7	.1	.8
99	65,325	7.2	1.2	.8	4.4	.1	.7
190	45,055	1.8	.4	.1	1.3	---------	(2)
281	42,928	.7	.2	(2)	.5	---------	---------
372	42,928	.2	.1	---------	.1	---------	---------
Nonended cases	*85,566*	*1.9*	*.5*	*.1*	*1.1*	(2)	*.2*
Total, ended and nonended cases	*85,566*	*105.4*	*41.0*	*16.9*	*34.6*	*1.3*	*11.6*
		Females					
8	13,683	155.7	65.8	23.1	48.4	3.6	14.8
15	13,683	101.4	28.7	19.9	38.6	3.1	11.1
22	13,683	75.6	15.9	17.5	31.3	2.5	8.4
29	13,683	60.6	10.7	15.3	25.4	2.3	6.9
36	13,683	49.3	7.7	12.5	22.4	1.7	5.0
43	13,683	40.0	6.3	9.2	19.1	1.5	3.9
50	13,683	31.1	4.8	6.3	15.2	1.4	3.4
57	12,892	25.9	3.7	4.7	13.5	1.4	2.6
64	11,880	20.8	3.3	2.9	11.2	1.3	2.1
71	11,880	17.8	2.8	2.3	9.8	1.1	1.8
78	10,721	16.7	2.6	1.9	9.5	1.0	1.7
85	10,721	14.0	2.4	1.6	7.7	.9	1.4
92	9,731	11.9	2.2	1.4	6.5	.6	1.2
99	9,731	10.3	2.2	1.0	5.9	.3	.9
190	3,627	.8	---------	.3	.5	---------	---------
281	3,627	.6	---------	.3	.3	---------	---------
372	3,627	---------	---------	---------	---------	---------	---------
Nonended cases	*13,683*	*3.0*	*.4*	*.1*	*2.0*	*.3*	*.2*
Total, ended and nonended cases	*13,683*	*158.7*	*66.2*	*23.2*	*50.3*	*3.9*	*15.0*

[1] "Various industries" includes all of the reporting industries that submitted data on individual case durations. The males are represented by 26 industries, the females by 21.
[2] Less than 0.05 case per 1,000.

[2] Summation of neuralgia, neuritis, and sciatica; rheumatism, acute and chronic; and diseases of the organs of locomotion except diseases of the joints.

Case duration.—Table 2 shows the frequency of ended cases lasting a certain number of days, *t*, or longer, by sex and broad cause group. Thus, among the males the frequency of ended cases accounted for by all causes and lasting 15 days or longer is 65.1 per 1,000 while the corresponding frequency for the females is 101.4. The magnitude of the rapidity of decrease of the frequencies with increasing values of *t* is determined by whether or not there is a preponderance of long or short cases, the long cases inhibiting the rate of decrease while the short ones accelerate it. Thus, while the group of respiratory diseases, when compared with the other cause groups, shows the highest initial frequency for both males and females, the decrease of the frequencies of this group is rapid because of the relatively large number of short cases.[3]

TABLE 3.—*Frequency of cases of sickness and nonindustrial injuries lasting 8 consecutive calendar days or longer among MALE employees in various industries by cause, the first quarter of 1941 compared with the first quarters of 1940 and 1939* [1]

Cause (numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of cases per 1,000 males for the first quarter		
	1941	1940	1939
Sickness and nonindustrial injuries [2]	138.2	134.8	125.3
Nonindustrial injuries (169–195)	11.3	12.6	9.6
Sickness [2]	126.9	122.2	115.7
Respiratory diseases	78.9	69.9	65.9
Influenza and grippe (33)	50.7	39.4	39.9
Bronchitis, acute and chronic (106)	7.8	8.7	6.6
Diseases of the pharynx and tonsils (part of 115)	5.5	6.1	5.7
Pneumonia, all forms (107–109)	5.8	6.2	4.7
Tuberculosis of the respiratory system (13)	.5	.7	.8
Other respiratory diseases (104, 105, 110–114)	8.6	8.8	8.2
Nonrespiratory diseases	44.9	50.1	47.4
Digestive diseases	14.4	15.4	14.2
Diseases of the stomach, except cancer (117, 118)	3.8	4.1	3.6
Diarrhea and enteritis (120)	1.2	1.4	1.1
Appendicitis (121)	5.1	5.5	4.5
Hernia (part of 122)	1.6	1.4	1.4
Other digestive diseases (part of 115 and 122, 116, 123–129)	2.7	3.0	3.6
Nondigestive diseases	30.5	34.7	33.2
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	4.5	5.2	5.3
Other genitourinary diseases (133–138)	2.1	3.0	2.3
Neuralgia, neuritis, sciatica (part of 87)	3.1	2.9	2.3
Neurasthenia and the like (part of 84)	.8	1.1	1.0
Other diseases of the nervous system (80–83, 85, part of 84 and 87)	1.1	1.2	1.1
Rheumatism, acute and chronic (58, 59)	4.7	4.6	4.5
Diseases of the organs of locomotion, except diseases of the joints (part of 156)	2.9	3.4	3.1
Diseases of the skin (151–153)	2.3	3.2	2.7
Infectious and parasitic diseases [3] (1–12, 14–24, 26–29, 31, 32, 34–44)	2.4	2.2	3.0
All other diseases (45–57, 60–79, 88, 89, 100, 101, 103, 154, 155, 157, 162, part of 156)	7.6	7.9	7.9
Ill-defined and unknown causes (200)	3.1	2.2	2.4
Average number of males covered in the record	223,684	196,766	170,649
Number of organizations	26	26	26

[1] The same 26 organizations are included in 1941, 1940, and 1939.
[2] Industrial injuries, venereal diseases, and a few numerically unimportant causes of disability are not reported.
[3] Except influenza, respiratory tuberculosis, and the venereal diseases.

[3] Item 5 in the list of references contains further details on the behavior of frequency in relation to duration.

First quarter of the year 1941.—The morbidity experience among the male members of 26 industrial sick benefit organizations for the first quarter of 1941 as compared with the corresponding quarter of 1940 and 1939 is shown in table 3. Interest in the table centers around the frequency for influenza and grippe with its increase of approximately 30 percent when compared with 1940 or 1939. The rate for the first quarter of 1941 (50.7) is sufficiently large to indicate an epidemic. During the 13-year period, 1929–41, this rate was equalled in 1931 and exceeded in 1929 (77.4) and 1937 (60.9), the mean for the 13 first quarter rates being 39.3.

REFERENCES

(*1*) Gafafer, W. M.: Disabling morbidity among male and female industrial workers during 1938 and 1939, and among males during the first quarter of 1940, with an inquiry into the occurrence of multiple attacks of disabling sickness and injuries, 1939. Pub. Health Rep., **55**: 1402–1406 (August 2, 1940).

(*2*) ————: Disabling morbidity among industrial workers, second quarter and first half of 1940, with a note on the occurrence of bronchitis, pneumonia, and appendicitis, 1931–40. Pub. Health Rep., **55**: 2127–2130 (November 15, 1940).

(*3*) ————: Disabling morbidity among industrial workers, third quarter of 1940, with observations on influenza, bronchitis, and pneumonia, 1931–40. Pub. Health Rep., **55**: 2397–2398 (December 27, 1940).

(*4*) ————: Disabling morbidity among industrial workers, final quarter of 1940, with an index of the previous publications of this series. Pub. Health Rep., **56**: 799–801 (April 11, 1941).

(*5*) Gafafer, W. M., and Frasier, E. S.: Studies on the duration of disabling sickness. I. Duration of disability from sickness and nonindustrial injuries among the male and female memberships of 25 industrial sick benefit organizations, 1935–37, inclusive. Pub. Health Rep., **55**: 1892–1903 (October 18, 1940).

DEATHS DURING WEEK ENDED AUGUST 30, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Aug. 30, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,091	7,274
Average for 3 prior years	7,125	
Total deaths, first 35 weeks of year	299,165	300,015
Deaths per 1,000 population, first 35 weeks of year, annual rate	11.9	12.0
Deaths under 1 year of age	535	498
Average for 3 prior years	489	
Deaths under 1 year of age, first 35 weeks of year	18,380	17,600
Data from industrial insurance companies:		
Policies in force	64,441,524	64,944,214
Number of death claims	9,397	10,089
Death claims per 1,000 policies in force, annual rate	7.6	8.1
Death claims per 1,000 policies, first 35 weeks of year, annual rate	9.7	9.9

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control diseases without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED SEPTEMBER 6, 1941

Summary

The number of cases of poliomyelitis reported during the current week dropped to 584 as compared with 624 for the preceding week. While the rate of increase declined during each of the preceding two weeks, this is the first week since June 14 in which a decrease has been recorded for the total number of cases reported.

The following listed 13 States reported 15 or more cases during the current week (last week's figures in parentheses): New York, 71 (69); Pennsylvania 66 (65); Alabama 66 (65); Georgia 49 (50); Tennessee 38 (29); Ohio 33 (36); New Jersey 32 (29); Minnesota 23 (21); Illinois 21 (31); Massachusetts 18 (21); Kentucky 18 (15); Maryland 16 (32); Virginia 15 (5) These are the same States which reported 15 or more cases last week, with the exception that Virginia is included currently while the numbers of cases in Michigan and Florida dropped below 15.

A total of 4,609 cases of poliomyelitis has been reported in the United States this year to date (first 36 weeks), as compared with 5,512 for the corresponding period in 1937, when the largest number of cases was reported for this period during the preceding 5 years (1936–40), and with 4,059 in 1940, the next highest year.

The number of cases of encephalitis increased in North Dakota from 98 to 151, while the incidence decreased in Minnesota from 51 to 30, in South Dakota from 13 to 11, and in Colorado from 32 to 24. From August 16 to 30, 24 cases were reported in Wisconsin, distributed throughout the State.[1]

All of the 12 cases of Rocky Mountain spotted fever reported during the current week, with the exception of 1 case in Missouri, occurred in States east of the Mississippi River. Of 86 cases of endemic typhus fever, 39 cases occurred in Georgia and 15 in Texas. One case was reported in New York City.

The death rate for the current week in 88 large cities in the United States was 10.4 per 1,000 population, as compared with 9.9 for the preceding week and the 3-year (1938–40) average. The accumulative rate to date (first 36 weeks) is 11.9, which is the same as for the corresponding period in 1940.

[1] For recent reports of encephalitis in the Province of Manitoba, Canada, see p. 1861

Telegraphic morbidity reports from State health officers for the week ended September 6, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940	
NEW ENG.												
Maine	0	1	1	------	------	------	12	14	1	0	0	0
New Hampshire	0	0	0	------	------	------	1	0	0	0	0	0
Vermont	1	0	0	------	------	------	25	0	2	1	0	0
Massachusetts	0	2	2	------	------	------	84	31	21	1	0	1
Rhode Island	0	0	0	------	------	------	1	0	------	1	0	0
Connecticut	0	0	0	------	1	1	10	5	5	0	0	0
MID. ATL.												
New York [1]	4	8	13	[2]1	[2]8	[2]2	71	102	74	7	2	3
New Jersey	2	4	3	2	5	5	33	43	18	0	0	1
Pennsylvania	10	5	10	------	------	------	76	33	33	4	4	2
E. NO. CEN.												
Ohio [3]	10	3	14	7	10	2	18	18	12	2	1	1
Indiana	4	4	7	19	8	8	2	5	6	0	1	1
Illinois [3]	16	9	11	------	3	3	84	23	21	2	0	1
Michigan [4]	3	4	5	------	5	------	11	51	13	0	1	1
Wisconsin	0	1	2	13	15	15	61	53	28	1	1	1
W. NO. CEN.												
Minnesota	6	7	5	------	1	1	4	9	9	0	0	0
Iowa	2	4	4	------	4	------	3	8	3	1	0	0
Missouri [3]	4	8	12	11	1	5	6	2	2	1	0	0
North Dakota	1	6	1	7	2	------	6	0	0	0	0	0
South Dakota	9	1	0	------	------	------	2	0	0	0	0	0
Nebraska	0	1	1	------	------	------	1	2	1	0	1	0
Kansas	0	4	7	2	1	1	1	4	3	1	1	0
SO. ATL.												
Delaware	0	1	0	------	------	------	1	1	------	0	0	0
Maryland [3] [4]	0	1	3	------	2	2	20	5	4	2	0	0
Dist. of Col.	1	1	1	------	------	1	6	1	1	0	0	0
Virginia [3]	12	8	37	119	76	------	34	10	8	4	0	2
West Virginia [3] [4]	5	7	7	------	15	10	21	2	1	2	3	1
North Carolina [1] [3]	34	24	38	------	1	1	24	8	8	1	3	2
South Carolina [1]	41	7	24	93	120	120	27	18	5	0	0	0
Georgia [1]	23	10	31	19	14	------	39	2	------	1	0	1
Florida [1]	8	3	8	2	1	------	4	2	2	0	0	1
E. SO. CEN.												
Kentucky	11	3	12	------	1	5	6	7	7	3	0	2
Tennessee [1]	25	8	17	2	11	11	25	25	7	4	0	1
Alabama [1]	33	6	31	2	3	6	2	5	3	1	1	1
Mississippi [4]	10	18	19	------	------	------	------	------	------	1	2	0
W. SO. CEN.												
Arkansas	15	5	9	4	3	3	21	8	4	0	0	0
Louisiana [1]	4	7	5	1	------	3	3	2	2	0	0	0
Oklahoma	8	3	8	20	15	15	6	2	4	0	0	0
Texas [1] [4]	27	13	28	329	101	58	48	15	15	1	1	2
MOUNTAIN												
Montana	3	0	1	------	4	4	2	4	2	0	0	0
Idaho	0	0	1	------	------	------	0	0	1	0	0	0
Wyoming	0	0	0	8	------	------	3	1	1	0	0	0
Colorado	8	13	5	36	1	------	13	3	9	1	0	1
New Mexico	0	5	5	------	------	------	5	5	3	0	0	0
Arizona	1	0	0	25	10	14	23	3	3	1	0	0
Utah [4]	0	1	0	3	2	1	9	6	3	0	0	0
Nevada	0	------	------	------	------	------	1	------	------	0	------	------
PACIFIC												
Washington	0	0	1	------	------	------	3	8	8	1	2	1
Oregon	1	3	1	3	1	4	7	5	4	1	0	0
California	7	8	13	18	4	11	62	25	23	0	0	1
Total	349	227	453	746	458	458	877	576	495	46	24	36
36 weeks	8,424	9,458	14,870	601,643	170,447	152,791	833,081	230,613	271,308	1,513	1,235	2,250

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 6, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940		Sept. 6, 1941	Sept. 7, 1940	
NEW ENG.												
Maine	2	0	1	7	0	1	0	0	0	1	1	1
New Hampshire	1	0	0	2	1	0	0	0	0	0	0	0
Vermont	0	0	0	2	0	1	0	0	0	2	0	0
Massachusetts	18	3	3	31	22	22	0	0	0	2	2	3
Rhode Island	0	0	0	2	1	2	0	0	0	0	3	1
Connecticut	6	2	3	8	4	7	0	0	0	0	4	3
MID. ATL.												
New York [1]	71	17	20	66	56	56	0	0	0	17	11	20
New Jersey	32	4	4	28	26	18	0	0	0	3	3	7
Pennsylvania	66	11	11	35	52	52	0	0	0	22	30	30
E. NO. CEN.												
Ohio [3]	33	56	17	48	52	52	0	0	0	22	26	26
Indiana	4	81	3	9	16	17	0	0	1	7	9	9
Illinois [3]	21	40	30	40	75	78	1	0	0	10	17	35
Michigan [4]	7	139	49	18	47	59	0	0	0	6	7	10
Wisconsin	6	30	5	37	48	46	1	0	0	2	0	3
W. NO. CEN.												
Minnesota	23	12	12	18	20	20	0	0	0	0	1	2
Iowa	1	80	3	16	13	16	0	0	1	3	0	2
Missouri [3]	1	32	2	19	13	13	0	0	0	11	9	23
North Dakota	4	0	0	2	2	5	0	0	0	2	0	2
South Dakota	1	9	2	4	3	3	0	0	0	0	0	0
Nebraska	0	18	1	2	2	3	0	0	0	0	0	0
Kansas	6	58	0	30	24	31	0	0	0	1	7	7
SO. ATL.												
Delaware	0	0	0	2	1	0	0	0	0	2	2	1
Maryland [3 4]	16	0	1	11	13	14	0	0	0	5	1	9
Dist. of Col.	7	0	0	3	2	3	0	0	0	1	0	0
Virginia [3]	15	17	4	8	16	17	0	0	0	16	12	15
West Virginia [3 4]	2	51	2	8	15	19	0	0	0	9	9	19
North Carolina [1 3]	12	5	1	26	38	34	0	0	0	3	16	13
South Carolina [1]	10	1	1	11	7	7	0	0	0	17	21	19
Georgia [1]	49	0	0	16	19	14	0	0	0	15	39	24
Florida [1]	4	0	1	6	1	4	0	0	0	1	2	2
E. SO. CEN.												
Kentucky	18	17	4	23	20	27	0	0	0	32	13	38
Tennessee [1]	38	3	3	25	0	25	0	0	0	30	24	27
Alabama [1]	66	2	4	16	13	13	0	0	0	11	12	12
Mississippi [4]	10	1	1	7	9	9	0	0	0	10	13	13
W. SO. CEN.												
Arkansas	1	3	1	4	3	8	0	0	0	12	36	24
Louisiana [1]	3	2	2	4	2	3	0	0	0	15	25	19
Oklahoma	1	6	2	11	9	8	0	0	0	12	28	28
Texas [1 4]	3	4	4	18	11	24	0	0	0	26	50	47
MOUNTAIN												
Montana	1	8	1	1	11	5	0	0	1	1	1	2
Idaho	0	2	0	2	10	2	0	0	0	0	2	3
Wyoming	2	0	0	1	2	2	0	0	1	1	0	0
Colorado	3	3	3	15	11	8	0	0	2	3	6	6
New Mexico	1	1	1	1	0	5	0	0	0	2	9	8
Arizona	0	0	0	2	1	1	0	0	0	3	3	3
Utah [4]	4	0	0	0	4	4	0	0	0	0	0	1
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	2	14	2	11	5	10	0	0	8	2	1	2
Oregon	6	5	4	7	3	6	0	0	2	3	1	3
California	7	21	25	26	45	51	0	0	2	4	7	15
Total	584	758	436	689	748	910	2	0	28	347	463	606
36 weeks	4,609	4,059	3,445	93,759	120,804	139,717	1,197	1,988	8,136	5,499	6,247	8,743

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 6, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended Sept. 6, 1941	Whooping cough, Week ended Sept. 7, 1940
NEW ENG.		
Maine	13	38
New Hampshire	1	0
Vermont	6	11
Massachusetts	81	72
Rhode Island	25	0
Connecticut	26	44
MID. ATL.		
New York [1]	270	266
New Jersey	116	95
Pennsylvania	185	250
E. NO. CEN.		
Ohio [3]	322	335
Indiana	26	11
Illinois [3]	231	176
Michigan [4]	190	173
Wisconsin	232	73
W. NO. CEN.		
Minnesota	75	22
Iowa	26	25
Missouri [3]	64	30
North Dakota	22	3
South Dakota	9	2
Nebraska	2	8
Kansas	81	33
SO. ATL.		
Delaware	0	7
Maryland [3 4]	47	61
Dist. of Col	19	3
Virginia [3]	71	80
West Virginia [3 4]	16	38
North Carolina [1 3]	109	60

Division and State	Whooping cough, Week ended Sept. 6, 1941	Whooping cough, Week ended Sept. 7, 1910
SO. ATL.—continued		
South Carolina [1]	84	16
Georgia [1]	20	23
Florida [1]	9	0
E. SO. CEN.		
Kentucky	74	41
Tennessee [1]	59	33
Alabama [1]	14	7
Mississippi [4]	----------	----------
W. SO. CEN.		
Arkansas	13	19
Louisiana [1]	0	4
Oklahoma	8	12
Texas [1 4]	149	134
MOUNTAIN		
Montana	6	8
Idaho	0	0
Wyoming	19	3
Colorado	85	14
New Mexico	1	18
Arizona	7	2
Utah [4]	25	24
Nevada	0	----------
PACIFIC		
Washington	48	48
Oregon	20	5
California	191	215
Total	3,097	2,542
36 weeks	155,948	114,846

[1] Typhus fever, week ended Sept. 6, 1941, 86 cases as follows: New York, 1; North Carolina, 1; South Carolina, 2; Georgia, 39; Florida, 11; Tennessee, 1; Alabama, 8; Louisiana, 8; Texas, 15.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended Sept. 6, 1941, 12 cases as follows: Ohio, 2; Illinois, 1; Missouri, 1; Maryland, 1; Virginia, 2; West Virginia, 2; North Carolina, 3.
[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended August 23, 1941

This table lists the reports from 131 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Maine:											
Portland	0		0	0	1	0	0	0	0	2	19
New Hampshire:											
Concord	0		0	0	0	0	0	0	0	0	15
Manchester	0		0	0	0	0	0	0	0	0	15
Nashua	0		0	0	0	0	0	1	0	8	5
Vermont:											
Burlington	0		0	0	0	0	0	0	0	0	8
Rutland	0		0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0		0	10	5	19	0	2	1	18	140
Fall River	4		0	0	1	3	0	1	0	0	20
Springfield	0		0	7	0	1	0	0	0	5	25
Worcester	0		0	1	0	0	0	1	0	9	34
Rhode Island:											
Pawtucket	2		0	0	0	0	0	0	0	0	15
Providence	1		0	0	1	3	0	0	0	14	30
Connecticut:											
Bridgeport	0		0	0	1	1	0	1	1	1	25
Hartford	0		0	0	4	0	0	1	0	0	43
New Haven	0		0	5	0	0	0	0	1	5	38
New York:											
Buffalo	0		0	0	4	4	0	4	0	18	119
New York	7		0	16	30	18	0	75	9	130	1,158
Rochester	0		0	3	2	1	0	3	0	2	71
Syracuse	0		0	1	0	1	0	0	0	22	38
New Jersey:											
Camden	1		0	0	2	0	0	2	0	1	27
Newark	0		1	2	3	3	0	2	0	26	68
Trenton	0		0	0	1	3	0	1	2	0	21
Pennsylvania:											
Philadelphia	2		1	1	8	6	0	15	1	67	330
Pittsburgh	1		0	1	10	4	0	9		34	127
Reading	0		0	0	1	0	0	0	0	2	17
Scranton	0			1		0	0		0	2	
Ohio:											
Cincinnati	0		1	0	0	2	0	4	0	9	112
Cleveland	0	1	0	0	2	4	0	5	0	80	148
Columbus	0		0	3	0	2	0	3	0	8	84
Toledo	0		0	4	3	0	0	4	1	11	64
Indiana:											
Anderson	0		0	0	0	0	0	0	0	0	7
Fort Wayne	0		0	0	2	0	0	0	0	0	18
Indianapolis	0		0	1	3	1	0	3	0	5	69
Muncie	0		0	0	1	2	0	0	0	0	9
South Bend	0		0	0	0	0	0	0	0	0	11
Terre Haute	0		0	0	1	0	0	0	0	0	18
Illinois:											
Alton	0		0	0	0	0	0	0	0	0	9
Chicago	4	1	0	4	9	15	0	44	1	112	578
Elgin	0		0	1	1	2	0	0	0	1	9
Moline	0		0	0	0	0	0	0	0	3	13
Springfield	0		0	0	1	1	0	0	0	1	18
Michigan:											
Detroit	3		0	2	8	7	0	11	3	71	227
Flint	0		0	1	0	1	0	0	0	0	22
Grand Rapids	0		0	1	0	0	0	0	1	12	38
Wisconsin:											
Kenosha	0		0	1	0	0	0	0	0	0	6
Madison	0		0	0	0	0	0	0	0	3	12
Milwaukee	0		0	12	3	3	0	4	0	135	107
Racine	0		0	1	0	1	0	0	0	4	15
Superior	0		0	0	0	0	0	0	0	9	7
Minnesota:											
Duluth	0		0	0	1	1	0	0	0	8	20
Minneapolis	0		1	1	1	2	0	1	0	9	100
St. Paul	0		0	1	1	1	0	0	0	25	43
Iowa:											
Cedar Rapids	0			0		0	0		0	1	
Des Moines	0			0		2	0		1	0	27
Sioux City	0			0		0	0		0	14	
Waterloo	0			0		0	0		0	2	

City reports for week ended August 23, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Missouri:											
Kansas City	1	------	0	1	2	4	0	2	1	3	72
St. Joseph	0	------	0	0	5	0	0	0	0	1	22
St. Louis	2	1	0	3	6	6	0	5	2	22	177
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	0	9
Grand Forks	0	------	------	0	------	0	0	------	0	2	------
Minot	0	------	------	3	------	0	0	------	0	1	8
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Sioux Falls	1	------	------	0	------	0	0	------	0	0	9
Nebraska:											
Lincoln	0	------	------	1	------	0	0	------	0	0	------
Omaha	0	------	0	0	2	0	0	1	0	0	49
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	0	8
Topeka	0	------	0	0	4	1	0	0	0	11	14
Wichita	0	------	0	0	3	1	0	0	0	1	21
Delaware:											
Wilmington	0	------	0	0	1	1	0	0	0	0	23
Maryland:											
Baltimore	1	2	0	24	6	0	0	8	1	27	178
Cumberland	0	------	0	0	0	1	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	0	0	0	4
Dist. of Col.:											
Washington	0	------	0	7	2	4	0	8	2	23	138
Virginia:											
Lynchburg	1	------	0	2	0	0	0	1	1	0	12
Norfolk	0	------	0	0	1	1	0	1	0	0	24
Richmond	0	------	1	1	1	3	0	1	1	0	42
Roanoke	0	------	0	0	0	0	0	0	0	2	21
West Virginia:											
Charleston	0	------	0	0	0	0	0	0	0	1	12
Huntington	0	------	------	0	------	1	0	------	0	0	------
Wheeling	0	------	0	2	2	0	0	0	0	0	18
North Carolina:											
Gastonia	0	------	------	0	------	2	0	------	0	0	------
Wilmington	0	------	0	1	0	0	0	1	0	6	8
Winston-Salem	1	------	0	2	3	0	0	3	0	0	24
South Carolina:											
Charleston	0	1	0	0	0	1	0	0	1	3	20
Greenville	0	------	0	0	0	0	0	0	0	2	4
Georgia:											
Atlanta	1	2	0	12	1	1	0	6	1	2	75
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	0	1	0	1	0	2	0	1	2	0	19
Florida:											
Miami	0	------	0	0	1	0	0	0	1	16	35
St. Petersburg	0	------	0	0	1	0	0	0	0	0	16
Tampa	0	1	0	0	0	0	0	0	1	0	22
Kentucky:											
Ashland	0	------	0	0	0	0	0	0	1	1	9
Covington	0	------	0	0	1	0	0	3	0	0	15
Lexington	0	------	0	0	0	0	0	0	0	5	12
Louisville	1	------	0	2	0	4	0	4	0	12	43
Tennessee:											
Knoxville	0	------	0	1	0	2	0	0	1	4	28
Memphis	0	------	0	1	0	1	0	3	2	15	78
Nashville	0	------	0	0	1	0	0	1	0	8	47
Alabama:											
Birmingham	1	------	0	1	3	1	0	2	1	3	75
Mobile	0	------	0	0	1	0	0	1	0	0	23
Montgomery	0	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	1	1	0	4	2	0	0	1	0	0	34
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	0	8
New Orleans	2	------	0	0	10	0	0	15	0	12	163
Shreveport	0	------	0	0	2	0	0	1	0	0	17
Oklahoma:											
Oklahoma City	0	------	0	0	2	0	0	0	0	0	36
Tulsa	0	------	0	0	3	3	0	0	0	1	12
Texas:											
Dallas	4	------	0	6	0	2	0	0	0	1	59
Fort Worth	0	------	0	0	0	0	0	0	1	6	44
Galveston	0	------	0	0	3	0	0	0	0	2	20
Houston	0	------	0	1	3	4	0	6	2	17	78
San Antonio	0	1	1	0	4	0	0	9	0	1	82
Montana:											
Billings	0	------	0	0	0	1	0	0	0	4	4
Helena	0	------	0	0	0	0	0	0	0	0	5
Missoula	0	------	0	0	1	0	0	0	0	0	4

City reports for week ended August 23, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Idaho:											
Boise	0		0	0	0	0	0	0	0	0	5
Colorado:											
Denver	7	12	0	10	4	3	0	4	0	73	77
Pueblo	0		0	0	1	2	0	0	0	4	7
New Mexico:											
Albuquerque	0		0	0	0	0	0	2	0	0	19
Arizona:											
Phoenix	0	5		1		0	0		0	7	
Utah:											
Salt Lake City	0		0	0	0	1	0	0	1	16	28
Washington:											
Seattle	0		0	0	0	2	0	1	0	11	95
Spokane	0		0	0	0	3	0	1	3	5	36
Tacoma	0		0	0	2	0	0	0	0	6	33
Oregon:											
Portland	0		0	2	1	0	0	1	0	0	70
Salem	0			0		0	0		1	0	
California:											
Los Angeles	0	6	1	9	3	8	0	15	0	25	313
Sacramento	0		0	0	1	1	0	1	0	3	26
San Francisco	0		0	3	2	3	0	5	0	13	162

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Maine:			
Portland	0	0	1
Massachusetts:			
Boston	0	0	2
Worcester	0	0	1
Rhode Island:			
Providence	0	0	2
Connecticut:			
Hartford	0	0	1
New Haven	0	0	1
New York:			
Buffalo	0	0	3
New York	2	0	32
Rochester	0	0	1
New Jersey:			
Camden	0	0	1
Newark	0	0	1
Pennsylvania:			
Philadelphia	0	0	14
Pittsburgh	0	0	2
Ohio:			
Cincinnati	0	0	2
Cleveland	1	0	27
Toledo	0	0	1
Indiana:			
South Bend	0	0	1
Terre Haute	1	1	0
Illinois:			
Chicago	1	2	11
Michigan:			
Detroit	1	0	7
Wisconsin:			
Madison	0	0	3
Minnesota:			
Duluth	0	0	1
Minneapolis	0	0	1
St. Paul	0	0	6
Missouri:			
St. Louis	0	0	3
Delaware:			
Wilmington	0	0	2
Maryland:			
Baltimore	1	0	13
Cumberland	0	0	1
Frederick	0	0	1
District of Columbia:			
Washington	0	0	6
Virginia:			
Norfolk	0	0	1
South Carolina:			
Greenville	0	0	1
Charleston	0	0	1
Georgia:			
Atlanta	0	0	4
Florida:			
Miami	0	0	1
Kentucky:			
Louisville	0	0	2
Tennessee:			
Knoxville	0	0	2
Nashville	0	0	4
Alabama:			
Birmingham	0	0	8
Montgomery	0	0	3
Louisiana:			
New Orleans	0	0	1
Shreveport	0	1	0
Oklahoma:			
Tulsa	0	0	1
Texas:			
Houston	0	0	3
Utah:			
Salt Lake City	0	0	1
Oregon:			
Portland	0	0	1
Salem	0	0	1
California:			
Los Angeles	0	0	4
San Francisco	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 4; Madison, 2; Minneapolis, 14; St. Paul, 4; Sioux City, 2; Fargo, 9; Grand Forks, 6 (also 11 old cases not reported before in Grand Forks); Minot, 21; Aberdeen, 2; Baltimore, 1; Denver, 4. Deaths: New York, 1; Madison, 1; Minneapolis, 4; St. Paul, 1; Fargo, 4; Aberdeen, 1; Topeka, 1; Baltimore, 1.

Pellagra.—Cases: Boston, 1.

Typhus fever.—Cases: New York, 2; Charleston, S. C., 1; Atlanta, 4; Brunswick, 2; Savannah, 4; Miami, 1; Birmingham, 1; Mobile, 1; Montgomery, 1; Lake Charles, 1; New Orleans, 4; Houston, 2. Deaths: Savannah, 1; Fort Worth, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,841,378)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Aug. 23, 1941	6 9	4.6	1.1	25.6	28.8	25.4	0.0	45.5	6.5	184.1
Average, 1936–40	10 7	4.2	1.6	31.5	39.1	33.5	0.8	51.1	11.1	186.4

PLAGUE INFECTION IN FLEAS IN KERN AND SISKIYOU COUNTIES, CALIF.

Under date of August 26, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 207 fleas from 19 ground squirrels, *C. beecheyi*, submitted to the laboratory on July 14 from a ranch at Keene, Kern County, Calif.

Under the same date Dr. Brown also reported plague infection proved, by animal inoculation and cultures, in 3 pools of fleas from ground squirrels, *C. douglasii*, in Siskiyou County, Calif., as follows: One a pool of 136 fleas from 4 ground squirrels submitted to the laboratory on July 23 from a ranch 2 miles east and one-half mile south of Yreka, another a pool of 43 fleas from 2 ground squirrels submitted to the laboratory on August 8 from a location 1 mile north and 2 miles west of Weed, and the third a pool of 50 fleas from 7 ground squirrels taken on August 8 from a ranch 1½ miles north and 2½ miles west of Weed.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended August 2, 1941.—During the week ended August 2, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis			1	4	7	2			4	18
Chickenpox		6		23	70	9	22	17	24	171
Diphtheria	4	9	2	14		1				30
Dysentery				2						2
Influenza					4		7		5	16
Lethargic encephalitis						2				2
Measles		9		262	100	8	16	6	64	465
Mumps				40	51	5	15	12		123
Pneumonia		3			2		1		5	11
Poliomyelitis			24	3		78	4	1	2	112
Scarlet fever		7	2	43	56	2		6	5	121
Trachoma									1	1
Tuberculosis	1	12	17	101	22	2		4		159
Typhoid and paratyphoid fever			3	26	4		1		1	35
Whooping cough			3	41	191	2	7	2	11	257

Manitoba—Poliomyelitis.—During the week ended September 5, 1941, 78 new cases of poliomyelitis were reported in Manitoba, making a total of 758 cases since June 30, 1941.

Encephalitis.—During the week ended September 5, 1941, 70 cases of encephalitis have been reported bringing the total number to 409 in Manitoba since August 1, 1941.

According to recent information, a report made by the Rockefeller Institute of Medical Research stated that the first blood sample from a patient in Winnipeg during the present epidemic indicated that the disease was caused by the western equine type of virus.

The record of encephalitis in Winnipeg since 1919 indicates that heretofore the lowest incidence of the disease has occurred there in August and September, with the peak being reached in February. This would suggest that the cases previously reported in Winnipeg have been of a different type of disease from that currently prevailing.

It has been reported that the past summer has been unusually warm in Winnipeg, with an abundance of rainfall, and that there has been less activity in mosquito control than in recent prior years.

FINLAND

Communicable diseases—May 1941.—During the month of May 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	112	Poliomyelitis	8
Dysentery	4	Scarlet fever	368
Influenza	1,785	Typhoid fever	51
Paratyphoid fever	105		

MEXICO

Guaymas—Dengue.—Information received from the American Consul at Guaymas, Sonora, Mexico, under date of August 15, 1941, reported an outbreak of dengue in the city of Guaymas and vicinity during the preceding two weeks, with more than 3,000 cases in the city alone. It was stated that the epidemic was abating following control measures instituted by the public health officers, especially the elimination of mosquito breeding.

×

Public Health Reports

VOLUME 56 SEPTEMBER 19, 1941 NUMBER 38

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • SEPTEMBER 19, 1941 • *No. 38*

STUDIES ON THE EFFICACY OF A COMPLEX VACCINE AGAINST INFLUENZA A [1]

By F. L. HORSFALL, Jr., E. H. LENNETTE, E. R. RICKARD, and G. K. HIRST

Experimental vaccines containing influenza A virus (*1*) have been tested in human volunteers previously. Stokes and his coworkers (*2*, *3*) gave parenteral injections of active influenza A virus, which had been propagated either in tissue culture medium or in mouse lungs. Subsequently they studied the incidence of acute respiratory disease during epidemics which they considered to be influenza and which affected both the vaccinated and control groups. These authors suggested that the vaccines used had increased immunity to influenza since they found that the attack rate for "febrile respiratory disease" was significantly reduced among the vaccinated individuals. Smith, Andrewes, and Stuart-Harris (*4*), as well as Taylor and Dreguss (*5*), gave subcutaneous injections of formaldehyde-inactivated mouse lung virus to volunteers. They also followed the groups of vaccinated and control individuals through epidemics of influenza which occurred shortly after the vaccine had been administered. Both of these groups of investigators showed that a considerable proportion of the cases they studied had been infected by influenza A virus. However, neither group obtained any evidence that the vaccine used produced demonstrable immunity to the disease. It appears from the available published data that no vaccine has yet been found which will regularly produce immunity to influenza in human beings.

It was recently reported (*6*) that a complex vaccine prepared from chick embryos inoculated with both influenza A virus and the X strain of canine distemper virus was more effective than other vaccines studied in stimulating the production of specific neutralizing antibodies against influenza A virus in human beings. These results made it seem possible that this vaccine might prove somewhat more effective as a prophylactic agent against influenza A than other types of vaccines investigated previously. To test this possibility, field tests with the complex vaccine were carried out in order that

[1] From the Laboratories of the International Health Division of The Rockefeller Foundation, New York.

any active immunity which followed its administration could be assessed directly under naturally occurring conditions. It is the purpose of this paper to report the results obtained and to present evidence that, after a single subcutaneous injection of the complex vaccine given 4 months prior to an epidemic of influenza, there occurred a significant reduction in the incidence of influenza A among vaccinated individuals.

METHODS

Viruses.—The PR8 strain (*7*) of influenza A virus (*1*) and the X strain (*8*) of canine distemper virus were used in this study.

Vaccine.—The preparation of the complex chick embryo vaccine has been described in detai previously (*6*). Eight separate lots of vaccine were used in this study. The method of preparation of these lots was, briefly, as follows: A 1 percent suspension of the ninth chick embryo passage of the PR8 strain of influenza A virus was mixed with a 10 percent suspension of the second, third, or fifth chick embryo passage o' the X strain of canine distemper virus. The mixture was inoculated onto the chorio-allantoic membrane of 9- to 12-day-old white Leghorn chick embryos. The embryos were incubated for an additional 6 days, after which they were removed from their shells aseptically and ground to a 33 percent suspension in 0.85 percent NaCl. Sufficient formalin was added to give a final concentration of formaldehyde of 1:4,400, and the suspension was stored at 4° C. for 48 hours. Then sufficient 0.85 percent NaCl was added to make a final suspension of 20 percent ch ck embryo, and the excess formaldehyde was neutralized by the addition o ammonia water to a final concentration of ammonia of 1:16,000. The suspension was then centrifuged for 15 minutes at 1,500 r. p. m. The supernatant was removed, distributed in pyrex ampoules, frozen in a mixture of alcohol and solid CO_2, and desiccated by the method of Bauer and Pickels (*9*). The desiccated vaccine was stored at 4° C. and subsequently was kept at room temperature for varying intervals.

Seven of the eight lots of vaccine contained by mouse titration similar quantities of influenza A virus before formaldehyde inactivation. On the average, 1 cc. of each o' these seven lots contained $10^{4.6}$ fifty percent mortality doses and $10^{6.4}$ mouse pneumonia doses (*6*) of influenza A virus. The remaining lot of vaccine, designated Lot 4, contained only $10^{3.3}$ and $10^{5.1}$ corresponding doses of influenza A virus before inactivation. Prior to its administration Lot 4 was kept at room temperature for a period of 55 days.

Immediately before the vaccine was administered, the ampoule was opened and the dry powder rehydrated by the addition of a quantity of sterile distilled water equal to the original liquid volume. Each volunteer was given a single injection of 1 cc. of the vaccine subcu-

taneously. This quantity contained, on the average, approximately 20 mg. of chick embryo protein.

Volunteers.—In a number of State institutions volunteers were selected at random from among the inmate population. Approximately 40 percent of the inmates were vaccinated; the proportion ranged from 35 to 60 percent in single institutions. The remaining inmates in the same institutions who had not been vaccinated were considered to be normal controls.

Serum.—Serum was obtained from a number of volunteers who received each lot of vaccine. Two serum specimens were taken from each of these individuals, one immediately before vaccination and another 2 weeks later. From some individuals serum was also obtained 4 months after vaccination. When the epidemic of influenza occurred serum was obtained from as many cases as possible in both the vaccinated and control groups. Two serum specimens were taken from each case, one during the acute phase of the disease and another between 2 and 4 weeks later during convalescence.

Neutralization tests.—The technique by which neutralization tests were carried out has been described previously (*10*) and additional pertinent details are given in the preceding paper (*11*).

Calculation of neutralizing capacity.—The method by which this constant was calculated for each serum tested has been reported in earlier communications (*11, 12*).

Complement fixation tests.—The technique used in the complement fixation tests was identical with that described by Eaton and Rickard (*13*).

Determination of etiology of influenza.—Acute-phase and convalescent sera from individual cases were tested simultaneously. In each case studied the titers of complement-fixing antibodies against influenza A virus of both serum specimens were determined. An increase of one dilution or more in the titer of the convalescent serum was considered a significant increase in antibodies and was, therefore, taken as evidence that the patient had influenza A. In approximately 30 percent of the cases studied the neutralizing capacities against influenza A virus of both serum specimens were determined also. An increase in neutralizing capacity during convalescence of log 0.86 was considered a significant increase in antibodies which indicated that influenza A had occurred. In those cases in which there was a discrepancy between the results of the complement fixation and the neutralization tests, the former tests were disregarded and an etiological diagnosis was determined by the latter tests since these were considered to be the more accurate. In selected cases throat washings were tested in ferrets, hamsters, or both, for the presence of influenza A virus by the techniques described in a preceding paper (*14*).

EXPERIMENTAL

Neutralizing antibodies against influenza A virus before and after vaccination.—The neutralizing capacities against the PR8 strain of influenza A virus of serum obtained from a number of volunteers immediately before and at intervals after the subcutaneous administration of 1 cc. of complex vaccine were determined. It was found that, except for Lot 4, the various preparations of vaccine used were of approximately equal antigenic potency, as judged by the increase in neutralizing antibodies which followed their administration in individuals with comparable prevaccination antibody levels.

The results are presented graphically in figure 1. Individuals who were given Lot 4 have been excluded from this analysis for reasons

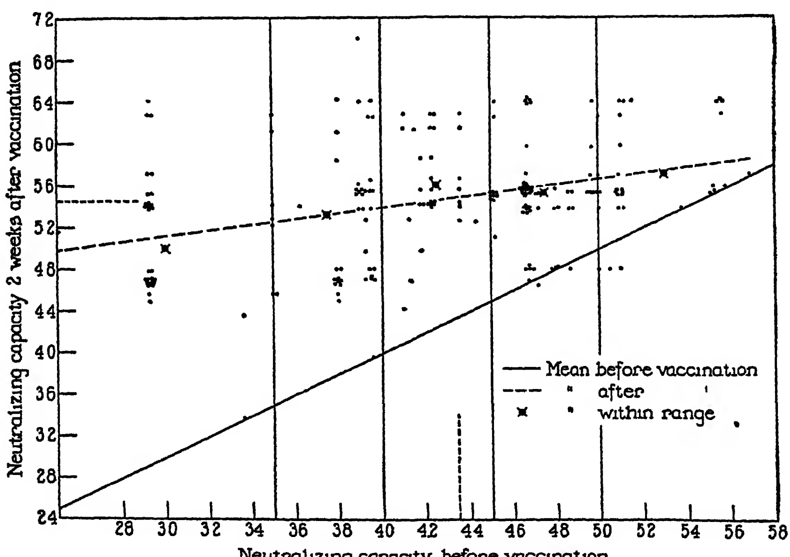


FIGURE 1.—Neutralizing antibody levels against influenza A virus in the serum of 288 individuals before and 2 weeks after each had received one subcutaneous injection of 1.0 cc. of complex vaccine.

given below. The neutralizing capacity of the prevaccination serum has been plotted against the neutralizing capacity of the serum taken 2 weeks after vaccination. A straight line has been drawn through those points which correspond to identical capacities before and after vaccination. The vertical distance from this line to a point above it represents the extent of the increase in antibody level observed in an individual volunteer. It will be noted that among 288 vaccinated individuals an increase in neutralizing antibodies was demonstrated in all but 17 instances. It is apparent that there were wide differences in the quantities of antibodies produced, even by individuals who possessed identical antibody levels prior to vaccination. The wide variations in the specific responses to the vaccine seemed to be almost independent of the initial antibody level. However, the increase in

neutralizing capacity was related to the prevaccination level. In general, the lower the neutralizing capacity before vaccination, the greater was the increase in antibodies after vaccination. The geometric means of the neutralizing capacities of the postvaccination sera obtained from individuals who initially possessed serum in the neutralizing capacity ranges, log 3.50 or less, log 3.51 to 4.00, log 4.01 to 4.50, log 4.51 to 5.00, and log 5.01 to 5.80, respectively, were calculated and are shown in figure 1. A straight broken line which appeared to fit these five points was drawn through them. It will be observed that this line has a definite slope and that the mean neutralizing capacity following vaccination was highest in the group who possessed before vaccination the highest antibody level, even though the mean *increase* in neutralizing capacity in this group was lowest of all. The mean postvaccination neutralizing capacity for the entire group was log 5.45. Among 114 individuals who possessed, prior to vaccination, capacities in the range log 4.35 or less, the mean increase after vaccination was log 1.70, which represents an increase in antibody level of 50 times. This figure corresponds fairly well with that obtained previously (*6*) in a smaller group in the same range. Among 35 individuals in this antibody range who received Lot 4 the mean increase in neutralizing capacity after vaccination was only log 0.69, which represents an increase in antibody level of but 5 times. For reasons which are not clear, Lot 4 appears to have been of very low antigenic potency, and the antibody responses which followed its administration were much lower than those observed with any of the other lots used.

In figure 2 are shown graphically the relative distributions of antibody levels against influenza A virus among 1,321 normal persons, 288 individuals 2 weeks after vaccination, and 78 individuals 4 months after vaccination. The proportion of individuals in each of the neutralizing capacity ranges 0 to log 2.62, log 2.63 to 3.49, log 3.50 to 4.35, log 4.36 to 5.22, and log 5.23 to 6.09, respectively, have been plotted against the mean capacities in each range. Smooth curves have been drawn through the points to facilitate an interpretation of the results. The data for normal individuals are identical with those given in the preceding paper (*11*). It will be observed that the proportion of individuals in the two highest ranges was markedly increased 2 weeks after vaccination and that less than 1 percent of vaccinated individuals had neutralizing capacities of log 4.0 or less at this time. Four months after vaccination there was a definite reduction in the proportion of individuals in the two highest ranges, but no individuals were encountered at this time with neutralizing capacities of log 3.5 or less. The change in the distribution of antibodies from that found among normal individuals 2 weeks and 4 months after vaccination is clearly shown.

In a previous paper (*11*) it was shown that there was a correlation between neutralizing antibody levels against influenza A virus and the occurrence of influenza A. It was found that the higher the level of antibodies, the less likely was the development of the disease. It has been of interest to compare the distribution of antibody levels among cases of influenza A with that of individuals vaccinated 4 months previously. In figure 3 these data are presented graphically. The frequency with which the various neutralizing capacity ranges were encountered in 310 cases of influenza A and among 78 vaccinated individuals has been plotted against the mean capacity in each range. Smooth curves have been drawn through the experimental points. A vertical line has been inserted in the graph at a point corresponding

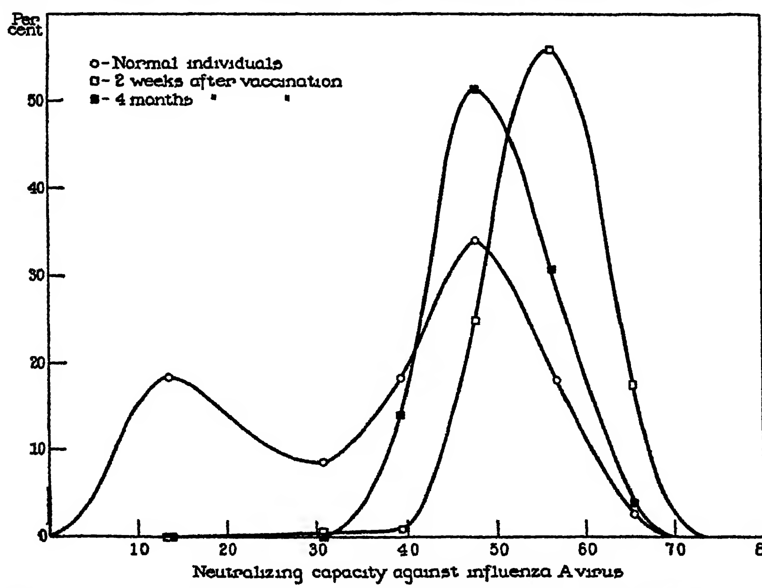


FIGURE 2.—Distribution of neutralizing antibody levels against influenza A virus among 1,321 normal persons, 288 individuals 2 weeks after vaccination, and 78 individuals 4 months after vaccination. Each vaccinated person was given one subcutaneous injection of 1.0 cc. of complex vaccine.

to the neutralizing capacity log 3.50. It was found that no vaccinated individual tested had a capacity of less than log 3.50 at the end of 4 months. On the other hand, as was shown previously (*11*), 41 percent of cases of influenza A occurred in individuals with antibody levels lower than log 3.50. If it can be assumed that the neutralizing antibodies which were produced as a result of vaccination were of identical significance to those naturally present, it can be calculated, on the basis of these data, that the incidence of influenza A among vaccinated individuals should have been reduced by approximately 30 percent.

Incidence of influenza A among vaccinated and control groups.—During October 1940 groups of volunteers in 15 institutions in Florida

and Alabama were given complex vaccine against influenza A. The total population of these institutions was 17,595. Of this number 7,907 persons were given a single subcutaneous injection of vaccine. The remaining 9,688 individuals were not vaccinated and were considered as normal controls.

Approximately 4 months after the vaccine had been given, epidemics of influenza occurred in 10 institutions. In 4 of these institutions Lot 4 had been used, while in the remaining 6 institutions other lots of vaccine had been given. It will be recalled that Lot 4 was of very low antigenic potency and that it produced only a small antibody response, whereas the other lots of vaccine stimulated the formation of considerable quantities of neutralizing antibodies against influenza A virus.

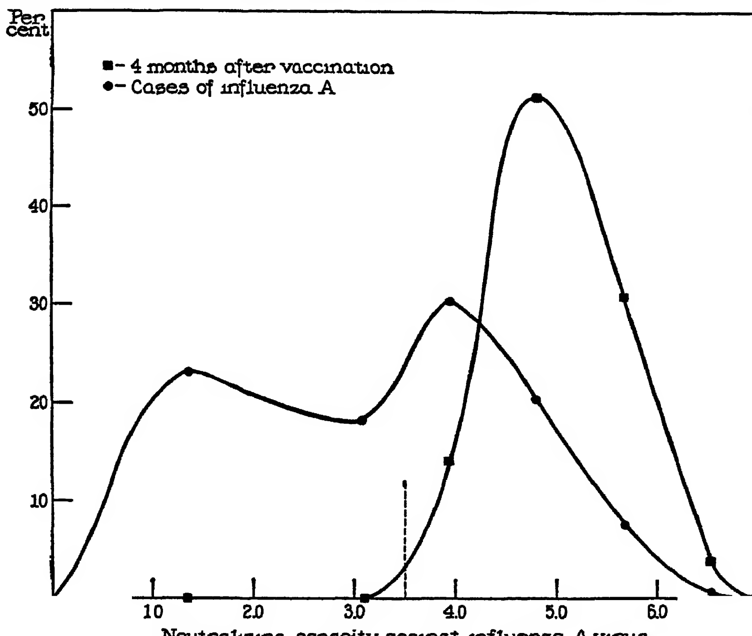


FIGURE 3.—Distribution of neutralizing antibody levels against influenza A virus among 310 cases of influenza A and 78 individuals 4 months after vaccination. Each vaccinated person was given one subcutaneous injection of 1.0 cc. of complex vaccine.

All cases of influenza which occurred in either the vaccinated or the control groups were recorded. Acute-phase and convalescent sera were obtained from as many cases as possible in both groups. These sera were tested by the methods described above in order that an etiological diagnosis could be established in each instance.

It was obviously impractical to attempt to carry out neutralization tests against influenza A virus with two serum specimens obtained from each case since the number of mice required would have been extremely large. However, before it was possible to place reliance upon the results of complement fixation tests with serum from vacci-

nated individuals, it was necessary to compare the results obtained by complement fixation and by neutralization techniques in a number of cases.

The results of both tests on acute-phase and convalescent sera from 282 cases are shown in table 1. It will be observed that among 156 cases in the control groups the two tests gave similar results in 85.9 percent and divergent results in 14.1 percent of cases. Among 126 cases in vaccinated individuals the two tests gave similar results in 80.2 percent and divergent results in 19.8 percent of cases. In the cases in the control groups the complement fixation test showed a significant increase in antibodies in 90.7 percent as many cases as did the neutralization test. In the cases among vaccinated individuals, on the other hand, the complement fixation test revealed a significant increase in antibodies in 103.8 percent as many cases as did the neutralization test. The results seemed sufficiently similar to make it feasible to use the complement fixation technique in establishing an etiological diagnosis. Despite the rather large error introduced by this method, it seemed probable, on the basis of comparisons between the two tests, that the complement fixation test would tend to increase rather than decrease the actual number of cases of influenza A among vaccinated individuals.

TABLE 1.—*Comparison between results of neutralization tests and complement fixation tests on acute-phase and convalescent sera from cases of influenza among vaccinated and control individuals*

Test which showed a significant increase in antibodies against influenza A virus	Cases of influenza			
	Control group		Vaccinated group (4 months after vaccination)	
	Number	*Percent*	*Number*	*Percent*
Neutralization and complement fixation	113	72.4	67	53 2
Neutralization only	17	10.9	11	8 7
Complement fixation only	5	3 2	14	11.1
Neither test	21	13 5	34	27.0
Total	156	100.0	126	100 0
Total discrepancies between tests	22	14 1	25	19.8
Influenza A by neutralization test	130	100 0	78	100 0
Influenza A by complement fixation test	118	90.7	81	103 8

In the 10 institutions there was a total of 1,450 cases of influenza. It was possible to establish an etiological diagnosis in 967 cases, or 66.7 percent. In the remaining cases either one or both serum specimens were unavailable. The results obtained in each institution are shown in table 2. Because Lot 4 was found to have stimulated the production of only about one-tenth as much antibodies as other lots of vaccine used, the results in Institutions 1 to 4, in which Lot 4 had been given, have been separated from those in the other institutions. It will be observed that the attack rate for clinical influenza among the control groups varied from 3.8 percent in Institution 8 to 36.1

percent in Institution 2. The attack rate for clinical influenza was lower in the vaccinated groups than in the control groups in Institutions 1 and 3 and higher in Institutions 2 and 4. When the 4 institutions were considered collectively, it was found that clinical influenza occurred in 11.4 percent of control individuals and in 9.3 percent of vaccinated individuals.

TABLE 2.—*Incidence of influenza among vaccinated and control groups in 10 institutional outbreaks 4 months after vaccination*

Institution	Control group							Vaccinated group							Influenza A ratio V/O
	Number	Cases of influenza		Cases studied		Incidence		Number	Cases of influenza		Cases studied		Incidence		
				Influenza A	Influenza "Y"	Influenza A	Influenza "Y"				Influenza A	Influenza "Y"	Influenza A	Influenza "Y"	
		No.	*Pct.*	*No.*	*No.*	*Pct.*	*Pct*		*No.*	*Pct.*	*No*	*No.*	*Pct.*	*Pct.*	
1	750	57	7.6	28	14	5.1	2.5	1,000	68	6.8	29	13	4 7	2.1	0 88
2	277	100	36.1	32	12	26.4	9.7	160	73	45.6	20	7	33 8	11 8	1 28
3	2,700	254	9.4	79	60	5.3	4.1	1,900	134	7.1	41	29	4.1	3.0	77
4	1,425	175	12.3	122	26	10.2	2.1	225	31	13.8	22	2	12 4	1.4	1.21
Total	5,152	586	11.4	261	112	7 9	3.5	3,285	306	9.3	112	51	6 4	2 9	.81
5	648	87	13.4	77	7	12.3	1.1	210	18	8.6	14	3	7.1	1 5	.58
6	190	46	24.2	25	2	22.0	2.2	110	36	32.8	9	5	21.0	11.8	.95
7	2,150	157	7.3	86	39	4.9	2.4	1,850	98	5.3	43	30	3.1	2.2	.63
8	875	33	3.8	16	8	2 5	1.3	725	20	2.8	8	7	1.4	1.4	.56
9	140	26	18.6	16	3	15.7	2 9	160	12	7.5	6	4	4.4	3 1	.28
10	400	16	4.0	8	7	2.0	2.0	400	9	2.2	1	7	.2	2.0	.10
Total	4,403	365	8.3	228	66	6.6	1.7	3,455	193	5.6	81	56	3 3	2.3	.50

In Institutions 5 to 10 the attack rate for clinical influenza was lower in the vaccinated groups than in the control groups in all except Institution 6. Considered collectively, clinical influenza occurred in 8.3 percent of control individuals and in 5.6 percent of vaccinated individuals in Institutions 5 to 10.

Since on the average 66.7 percent of cases were studied in order that an etiological diagnosis could be established, it is possible to calculate with reasonable accuracy the proportion of cases of influenza A in both groups in each institution. In table 2 the number of cases studied, the number in which a significant increase in antibodies against influenza A virus was demonstrated, and the number in which no significant increase in antibodies could be demonstrated are shown. On the basis of the proportion of cases studied which showed evidence of an antibody response against influenza A virus, the probable number of cases of influenza A among the total cases of clinical influenza in a given group could be calculated. From this figure the probable incidence of influenza A in a given group was determined. In a similar manner, on the basis of the proportion of cases which did not show evidence of an antibody response against influenza A virus, the probable

incidence of influenza of unknown cause, or influenza "Y" (*14*) in a given group was determined.

It will be seen that the incidence of influenza A varied from 2.0 percent to 26.4 percent in the control groups and from 0.2 percent to 33.8 percent in the vaccinated groups in Institutions 10 and 2, respectively. The incidence of influenza A was lower in the vaccinated groups than in the control groups in Institutions 1 and 3 and higher in Institutions 2 and 4. Taken together influenza A occurred in 7.9 percent of control individuals and in 6.4 percent of vaccinated individuals in Institutions 1 to 4. In Institutions 5 to 10 the incidence of influenza A was lower in the vaccinated groups than in the control groups in all instances. Considered as a whole, influenza A occurred in 6.6 percent of control individuals and in 3.3 percent of vaccinated individuals in these 6 institutions. It should be noted that with the single exception of Institution 6, the incidence of influenza "Y" in the control groups was almost identical to that in the vaccinated groups in each institution.

The V/C ratios shown in table 2 express in a single figure the difference between the incidence of influenza A in the vaccinated and control groups in each institution. This ratio was calculated by dividing the incidence of influenza A among vaccinated individuals by the incidence of influenza A among control individuals. A V/C ratio of 1.0 would indicate that the incidence was identical in the two groups. Ratios of less than 1.0 indicate the extent to which the incidence of influenza A was lower among vaccinated individuals. It will be noted that in Institutions 1 to 4 the ratio varied from 0.77 to 1.28 and that when the groups were considered collectively, the ratio was 0.81. This indicates that in these institutions there were 19 percent fewer cases of influenza A among the vaccinated group than among a control group of the same size. In Institutions 5 to 10 the ratio varied from 0.95 to 0.10 and for all 6 institutions it was 0.50. This indicates that in these institutions there were 50 percent fewer cases of influenza A among the vaccinated group than in a control group of identical size.

DISCUSSION

Influenza A is only one etiological variety of the clinical syndrome termed influenza. It is now well established that there are other distinct etiological varieties of influenza and that these specific diseases may and often do occur in epidemics of influenza simultaneously with influenza A.

The vaccine which was used in this study contained inactivated influenza A virus and stimulated the production of antibodies against this agent. It did not contain influenza B virus and it was to be expected, therefore, that the vaccine would not produce an antibody

response against this virus. This has been found to be the case, and the additional antibodies which were produced following the administration of the vaccine were directed merely against influenza A virus.

Because of the constituents of the vaccine it was anticipated that any increased immunity which might have resulted from its administration would be operative only against influenza A and not against influenza B or influenza of unknown cause. To determine what efficacy the vaccine had in increasing immunity to this disease, it was necessary to establish the etiology of the epidemic which affected the vaccinated and control groups under study. To accomplish this it seemed essential to determine the nature of the agent responsible for the infection in as many cases as possible in both groups. Only by these extensive investigations did it seem feasible to arrive at an accurate appraisal of the possible prophylactic effectiveness of the vaccine against influenza A.

The results of these studies indicate that a single subcutaneous injection of complex vaccine given 4 months before the occurrence of an epidemic of influenza significantly reduced the incidence of influenza A in the vaccinated groups. The extent to which the incidence of influenza A was reduced seems to have been related to the extent to which antibodies against influenza A virus were increased. It will be recalled that among volunteers who were given a lot of vaccine one-tenth as effective as other lots in stimulating the production of antibodies, the incidence of influenza A was only 19 percent lower than among comparable control individuals. However, among volunteers who were given lots of vaccine which resulted in a considerable increase in antibodies, the incidence of influenza A was only one-half the incidence of the disease among comparable control individuals.

These results tend to confirm what might have been expected from what has been demonstrated previously (*11*) concerning the relationship between antibody levels against influenza A virus and the occurrence of influenza A. If the antibodies which resulted from the administration of vaccine had the same significance as antibodies normally present in human serum, it should be possible to calculate the extent to which antibody levels increased after vaccination would decrease the incidence of the disease. Calculations of this kind were carried out, and it was found that the observed reduction in the incidence of influenza A among vaccinated individuals was, if anything, somewhat greater than that anticipated on the basis of the increased antibody levels which were present 4 months after vaccination. It appears, therefore, that specific antibodies produced after vaccination have at least equal significance, but probably no greater significance, in contributing to immunity to influenza A than those possessed by normal individuals.

It seems important to emphasize that the available evidence indicates that no level of antibodies possessed by normal individuals, even though some were very high, could be taken to indicate complete immunity to influenza A. It has been shown (*11*) that in individuals with high antibody levels the disease occurred with markedly reduced frequency but still did occur occasionally. Similar considerations seem applicable to the degree of immunity which was present 4 months after the administration of the vaccine. The incidence of influenza A was significantly reduced, but the disease was not entirely prevented in vaccinated individuals.

The results obtained indicate that a vaccine which significantly increased antibodies against influenza A virus also significantly reduced the incidence of influenza A. Since the vaccine contained inactivated virus, it seems probable that its action was comparable to that of an inert antigen and that it served only to stimulate the production of antibodies and did not alter other factors which may possibly contribute to a state of relative immunity to influenza A. Under these circumstances it is likely that the increased immunity observed was directly attributable to the increased antibody levels possessed by vaccinated individuals.

The fact that influenza of unknown cause was not significantly reduced among vaccinated individuals is additional evidence for the specific relationship between antibody levels against one influenza virus and the probability of the occurrence of infection by the homologous virus.

SUMMARY

In volunteers who had received a single subcutaneous injection of complex vaccine of good antigenic potency 4 months previously the incidence of influenza A during an epidemic was 50 percent lower than among unvaccinated individuals in identical environmental circumstances. The incidence of influenza of unknown cause was not significantly different in the two groups.

REFERENCES

(*1*) Horsfall, F. L., Jr., Lennette, E. H., Rickard, E. R., Andrewes, C. H., Smith, W., and Stuart-Harris, C. H.: Lancet, **2**: 413 (1940).
(*2*) Stokes, J., Jr., Chenoweth, A. D., Waltz, A. D., Gladen, R. G., and Shaw, D. R.: J. Clin. Invest., **16**: 237 (1937).
(*3*) Stokes, J., Jr., McGuinness, A. C., Langner, P. H., and Shaw, D. R.: Am. J. Med. Sci., **194**: 757 (1937).
(*4*) Smith, W., Andrewes, C. H., and Stuart-Harris, C. H.: Great Britain Med. Research Council, Special Rep. Series, No. 228, 1938.
(*5*) Taylor, R. M., and Dreguss, M.: Am. J. Hyg., **31**: 31 (1940).
(*6*) Horsfall, F. L., Jr., Lennette, E. H., and Rickard, E. R.: J. Exp. Med., **73**: 335 (1941).
(*7*) Francis, T., Jr.: Science, **80**: 457 (1934).
(*8*) Horsfall, F. L., Jr., and Lennette, E. H.: Science, **91**: 492 (1940).
(*9*) Bauer, J. H., and Pickels, E. G.: J. Exp. Med., **71**: 83 (1940).

(10) Horsfall, F. L., Jr., Hahn, R. G., and Rickard, E. R.: J. Clin. Invest., **19**: 379 (1940).
(11) Rickard, E. R., Horsfall, F. L., Jr., Hirst, G. K., and Lennette, E. H.: The correlation between neutralizing antibodies in serum against influenza viruses and susceptibility to influenza in man. Pub. Health Rep., **56**: 1819 (1941).
(12) Horsfall, F. L., Jr., and Lennette, E. H.: J. Exp. Med., **73**: 327 (1941).
(13) Eaton, M. D., and Rickard, E. R.: Am. J. Hyg., **33**: 23 (1941).
(14) Lennette, E. H., Rickard, E. R., Hirst, G. K., and Horsfall, F. L., Jr.: The diverse etiology of epidemic influenza. Pub. Health Rep., **56**: 1777 (1941).

PRESENT-DAY METHODS FOR CONTROLLING *AËDES AEGYPTI* MOSQUITOES [1]

By JAMES H. LEVAN, *Passed Assistant Sanitary Engineer, United States Public Health Service*

Although the circular of the United States Public Health and Marine Hospital Service entitled "Yellow Fever and Mosquitoes" (*1*), issued during the last invasion of yellow fever, the 1905 New Orleans epidemic, contained information on mosquito-control measures that remains basic, experience and studies have resulted in still more specific knowledge about the habits and the breeding places of the yellow fever mosquito, *Aëdes aegypti.*

Since this species of mosquito breeds only in artificial containers it is controlled simply by frequent careful inspections of *all* artificial containers around premises and the application of control methods in the area to be sanitated. Wherever possible water-holding containers are destroyed; those that serve indispensable purposes are treated. This is a simple formula, and no complicated rules are necessary to apply it. But in a modern community it is very difficult to ferret out and to destroy or treat all water-holding containers.

This paper attempts to explain present-day methods used or developed by the Aëdes Aegypti Control Unit established by the Public Health Service, of which the writer was for 2 years the officer in charge.

All inspectors and supervisory personnel must be trained so that they can perform their tasks efficiently. Time in training inspectors may be saved by assembling them and projecting onto a screen slides showing the typical places where *aegypti* larvae are found. The modern camera with high-speed lens and fast film has made it easy to obtain a collection of such pictures.

Assignments of house-to-house inspectors are made daily from a city map divided into districts and sections. The results of a few days of actual inspections disclose whether the subdivisions made on the map should be changed.

---

[1] Presented before the National Malaria Committee, Louisville, Ky., November 13-15, 1940.

The cycle of house-to-house inspections should be about 7 days in summer. This can be increased to 14 days as the *Aëdes aegypti* index approaches zero. This index was used by us to observe the progress made in reducing the infestation of the aquatic forms of *aegypti* in the area in which the work was being done. It is the percentage of premises inspected where larvae were found expressed as a whole number multiplied by the percentage of samples collected containing *aegypti* larvae. The first-mentioned percentage expressed as a whole number shows the index of "domestic" mosquitoes, and multiplying it by the percentage of samples collected containing *aegypti* larvae is an attempt to produce a figure that will indicate the *aegypti* infestation. One sample of larvae was collected by the house-to-house inspectors from every property where larvae of "domestic" mosquitoes were found. An entomologist identified the specimens collected (*2*).

The house-to-house inspector must find all containers sustaining the aquatic forms of the *aegypti* mosquito and render harmless as many of these containers as he can. A record of the number of artificial containers producing *aegypti* is very necessary. A record of the number of water-holding containers that could produce mosquitoes has value because it gives an idea of the junk and debris that may be in the householders' yards.

In all sections of the municipality the house-to-house inspectors will find water-holding containers that cannot be destroyed or emptied because of their use. These can be controlled by placing them on a list to be visited every 10 days or oftener by a "10-day" inspector. Whenever possible this inspector applies light Diesel engine fuel oil to the water surface, using hand operated compressed air spray guns. It has been difficult to find spray guns equipped with oil-resisting hose and gaskets, but such equipment is now available. It is well worth while to purchase hose and gasket replacements that are oil resisting.

In order to control production in catch basins it is necessary to apply oil to every wet catch basin at least once every 10 days. Experience has shown that successful catch basin oiling requires the inspector to stop long enough at every catch basin to apply a sufficient dose of the oil larvicide. Inspectors should not be required to cover too large a territory in a given time. Many catch basins contain so much floating debris that it is likely that an oil spray applied through the surface grating will not cover the water surface and mosquito production will not be stopped by the oil application.

It was our experience that better results could be obtained in such catch basins by having the inspector submerge the oil pipe below the floating debris before applying the dose of larvicide.

Catch basin breeding can be controlled by applying oil from a pressure tank carried on a motorcycle or a light truck. A hose, quick operating valve, and an extension spray nozzle are necessary. While

it is usually possible to obtain compressed air from gasoline filling stations, a more dependable source of air is an automatically controlled gasoline-operated air compressor carried on the truck.

Old cisterns should be filled in whenever their owners can be induced to do so. In some cities there still is no public water supply and the citizens have to depend upon the storage of rainwater in underground cisterns or in surface tanks. Property owners are shown how cisterns, tanks, rain barrels, and other such containers can be reconstructed to render them mosquito-proof. When owners suggest screening openings and barrel tops the proper kind of durable 18-mesh wire cloth is recommended to them. Mosquito-proof construction is an important part of a control program but owners often are financially unable to make such improvements and other methods are needed to control mosquito production.

Because top-feeding minnows had been used successfully in open containers in yellow fever control in Tampico, Mexico, (*3*) and Guayaquil, Ecuador, (*4*) experiments were made by us to determine whether these minnows would feed in the dark. Experiments of others had shown that *Gambusia holbrooki* minnows feed mainly by attacking food when it is in motion, and it had been concluded that they were unsuited for introduction into dark, covered cisterns. Our experiments in Key West, Fla., (*2*) showed that their ability "to eat mosquito larvae seemed to depend more upon their appetite or capacity than upon the amount of light present," and that they were the local fish best suited to this purpose.

Cisterns were stocked, using one adult fish per square foot of water surface, or, roughly, 50 fish in an average cistern. The same proportion was used for other artificial containers.

Care is necessary in handling these fish, and the pregnant females are even more susceptible than the males to handling and chlorination injuries. Little harm results to either sex when reasonable care is used, and they are able to stand being poured into cisterns or being introduced through small openings when necessary, although some fish are always lost.

Before introducing them into cisterns it is necessary to acclimate them by placing them in successive containers of pond water, a mixture of pond and cistern water, and cistern water.

As a precaution against possible contamination of cisterns, the Key West sanitary officer had subjected *Gambusia* minnows to an overnight chlorinated water bath before placing them in cisterns. This practice was continued by us and experiments plus experience resulted in the use of dosages of liquid hypochlorite that would produce a chlorine residual of 0.1 to 0.15 part per million. The hypochlorite was added carefully because a high concentration, or overcontact with chlorinated water, always causes a high mortality among fish.

Occasionally householders refuse to permit fish to be placed in their cisterns. Such cisterns must be sprayed every 10 days with sufficient kerosene to form an unbroken film of oil on the water surface. Kerosene evaporates quickly and there is but slight possibility of its being drawn up into the water pipes because pump suction pipes extend almost to the bottom of the cistern.

Gambusia minnows are unable to remove heavy larval infestations from cisterns. This condition is met by spraying a cistern first with kerosene to kill the larvae. *Gambusia* are then introduced to prevent reinfestation. Apparently a kerosene film is not harmful to *Gambusia.*

As a means of preventing the development of a yellow fever epidemic in the event a case of this disease should occur, it had been planned to disinsecticize thoroughly the houses in the neighborhood of the first case to be reported. Both a pressure spray gun operated by a portable electrically driven air compressor and a specially built insecticide spraying truck were ready for use. This truck also carried portable electric insecticide sprayers.

This equipment was used in our regular control work to destroy severe infestations of adult *aegypti* mosquitoes inside and under dwellings, garages, and other buildings. The larvicide used was a mixture of 1 part of a concentrated extract of pyrethrum in oil (extract from 20 pounds pyrethrum flowers to each gallon) and 4 parts of light oil (refined kerosene). Householders always welcomed the relief from mosquito annoyance brought about by a disinsectization, although it was often necessary to refuse a request for a disinsectization because an inspection would disclose infestation with insects other than mosquitoes.

The extensive use of automobiles has resulted in the promiscuous discarding of old tires, particularly because of their present slight value as junk. Depending upon the size of the municipality, from hundreds to thousands of rubber tires are discarded weekly. It is almost impossible to remove all of the water accumulating in old tires lying outdoors or once having been outdoors. House-to-house inspectors should advise householders to prevent the accumulation of rainwater in old tires or should direct that they be destroyed. If the regular garbage removal service will not haul them away for incineration, removal becomes an activity of the mosquito control forces.

Junk or second-hand dealers sometimes allow discarded tires to accumulate. If they are not kept dry under cover, they should be piled so that they can be dusted with a paris green-lime mixture. The proportions of the mixture will vary with local conditions. Reinspection of the tires at intervals will show whether or not the application of paris green has been sufficiently heavy. It may be applied with

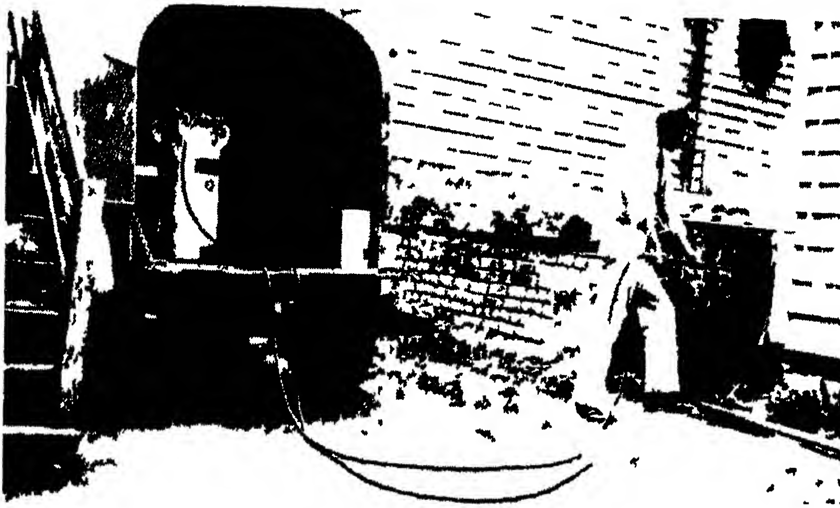


FIGURE 1.—An unused cistern not mosquito tight being sprayed with kerosene, using a power driven oil spraying unit (This same equipment was used to destroy *Aëdes aegypti* infestations in buildings)

FIGURE 2.—A "10-day" inspector spraying a cistern with kerosene

FIGURE 3.—A large pile of old automobile tires in a second-hand yard in which *A. aegypti* are breeding. Production is being controlled by dusting with paris green.

FIGURE 4.—Flashlight pointing to a hidden breeding place, a cistern under the floor of an unoccupied house.

a hand-operated agricultural duster, but a power-driven duster distributes the dust mixture more effectively.

Cemeteries must be included in regular inspections since prolific *aegypti* production is common in flower pots, vases, urns, and the like. It may be controlled effectively by placing in each flower container a pellet made of a wet mixture of 1 part of paris green and 4 parts of plaster of paris. Production in urns and other containers not used for flowers may be controlled by filling them with sand.

In South American cities *Aëdes aegypti* have been regularly controlled and have even been eradicated. Inspectors search the interiors of dwellings, and there are "special service" squads for hunting adult mosquitoes and hidden breeding foci. The search for adult mosquitoes is done chiefly in the interest of securing evidence of the existence of nearby breeding places. Inspectors there can eliminate water plants, plant cuttings, and water-holding containers that are kept indoors. The inspection of interiors of houses in the United States against the wishes of the occupants is something that cannot be attempted under nonepidemic conditions. In this country the inspector is able to inspect the interior of a house only because the occupant already recognizes the value of mosquito control.

Part of the work of the control forces is to secure public cooperation through an educational program presented by trained personnel.

SUMMARY

1. *Aëdes aegypti* mosquitoes are controlled by careful and thorough inspections of all premises, and the elimination of all artificial breeding containers.

2. Inspectors must be trained adequately in order to obtain maximum results.

3. Water-holding containers that cannot be emptied should be oiled regularly or should be stocked with top-feeding minnows.

4. These minnows can be used successfully in dark, covered drinking water cisterns. The minnows should be kept overnight in chlorinated water before being introduced into cisterns.

5. Catch basins require a heavier dose of oil larvicide when they contain floating debris.

6. Houses can be disinsecticized by thorough spraying with pyrethrum in an oil base.

7. Mosquito production in discarded automobile tires can be controlled by dusting them with a paris green-lime mixture.

8. Mosquito production in cemetery flower containers can be controlled by placing paris green pellets in them.

410620°—41——2

9. It is impossible under nonepidemic conditions to insist upon indoor inspection of houses, but the public, if properly informed, will cooperate and sometimes will request it.

REFERENCES

(*1*) Pub. Health Rep., **20**: 1555-1557 (1905).
(*2*) LeVan, J. H.: Measures instituted for the control of *Aedes aegypti*. Am. J. Pub Health, **30**: 595-599 (1940).
(*3*) The Use of Fish for Mosquito Control. International Health Board, Rockefeller Foundation, 1924.
(*4*) Connor, M. E.: Fish as mosquito destroyers. Natural History, **21**: 279-281 (1921).

THE INFLUENCE OF DIETARY FACTORS UPON THE THERAPEUTIC ACTIVITY OF SULFANILAMIDE IN MICE [1]

By Sanford M. Rosenthal, *Senior Pharmacologist, United States Public Health Service*

Previous investigation has demonstrated that diet influences the toxicity of sulfanilamide. We found (*1*) that the toxic effects of repeated administration of sulfanilamide to rabbits were greater upon an oats than a cabbage diet. Marshall and Litchfield (*2*) have shown that sulfanilamide administered orally was more toxic to fasting mice than to fed mice, and this difference was related to the concentrations of the drug in the blood. Smith, Lillie, and Stohlman (*3*) have recently shown that the anemia and mortality resulting from repeated oral administration of sulfanilamide to rats could be prevented, to a large degree, by a diet high in protein. Higher concentrations of sulfanilamide in the blood were observed by them in animals on diets low in proteins.

It has been shown that the bacteriostatic action of sulfanilamide in the test tube can be inhibited by peptone (Lockwood and Lynch (*4*)), by extracts of certain plant and animal tissues, and by 4-aminobenzoic acid (Woods (*5*)). Antagonism of the therapeutic effect of sulfanilamide *in vivo* by 4-aminobenzoic acid was demonstrated by Selbie (*6*).

The above considerations led us to investigate the possibility that some normal dietary constituents might influence the therapeutic activity of sulfanilamide.

Experiments were carried out upon a Swiss strain of albino mice. Groups of immature and adult mice were studied. The test organism was a virulent strain of hemolytic streptococcus (Lancefield group A) that we have employed for several years. When passed through mice every 2 to 3 weeks it has maintained a virulence such that 0.5 cc. of an 18-hour culture diluted 10^{-8} is lethal to mice when inocu-

[1] From the Division of Chemotherapy, National Institute of Health.

lated intraperitoneally. Inoculations were made in rotation, taking one animal from each group in succession, to insure uniform exposure for each group under test. Sulfanilamide was injected subcutaneously immediately after inoculation in a 1 percent aqueous solution in all of the experiments. This route was chosen to avoid any variations in gastro-intestinal absorption that might result from dietary changes. At first the mice were kept upon the special diets from 4 to 5 days preceding the therapeutic test until 1 day following the last injection of sulfanilamide when the stock diet of pellets was resumed. Later experiments revealed that the diets should be continued for at least 3 days after cessation of therapy to bring out the maximum influence. The special diets were terminated before the end of the observation period because the animals on the highly deficient diets lost weight and were often in poor condition.

Initial experiments indicated that therapeutic results were better in mice kept on a diet of corn starch (Argo brand) alone than in mice fed upon a diet of pellets employed in our laboratory [2] (table 1).

TABLE 1.—*The influence of dietary factors upon the therapeutic response to sulfanilamide. Mice upon diets for 4 days preceding therapeutic test. Sulfanilamide 0.5 gm. per kilo subcutaneously immediately following streptococcal inoculation, and repeated at daily intervals. Diets continued for 3 days following last dose of drug except in first experiment where diet A was replaced by pellets 24 hours after end of therapy. Composition of diets given in text*

Diet	Number of mice	Mean weight		Mean daily food intake	Streptococcus No. 16.5, dilution of culture	Doses of sulfanilamide	Deaths in days											Mortality, percent
		At onset	At inoculation				1	2	3	4	5	6	7	8	9	10	11-14	
		gm.	*gm.*	*gm.*														
A	33		10.8		10^{-6}	3				3	7	4		3				51.5
Pellets	37		13.0			3		15	2	5	5	3	1	1				86.5
A	15	(1)				0	15											100
Pellets	10	(1)				0	9											90
A	24	22.77	21.9	3.0	10^{-5}	3						1	2				1	16.7
E	25	23.3	25.5	3.17		3	2	2		2	1		3	2	1	1	1	60
Pellets	25	22.8	25.8			3	6	3	1	5	4	2						84
Pellets	18	(1)				0	18											100
A	20	17.5	15.07	2.9		2				1			1					10
B	20	17.1	16.6	2.65		2	2			2	5	2	1					60
C	20	17.0	15.47	2.6		2					1					2		15
D	20	16.46	14.2	2.55		2								1	1	1	2	25
E	20	17.35	18.6	3.51		2				2	3		2	1				40
Pellets	4	(1)			10^{-7}	0	3	1										100
	4				10^{-8}	0	2	2										100
	4				10^{-9}	0		1										25

[1] Controls.

[2] These pellets were Hunt Club Dog Chow from the Maritime Milling Co., Buffalo, N. Y. The ingredients, as stated on the bag, were: "Guaranteed analysis, minimum protein 25 percent, minimum fat 3.5 percent, maximum fiber 4 percent; 65 percent protein meat meal, beef liver meal, blood flour, dried skimmed milk, dried cheese whey, cheese rind, soy bean oil meal, wheat flakes, corn flakes, shredded wheat, alfalfa leaf meal, processed wheat bran, 0.5 percent brewers' yeast, 0.05 percent irradiated brewers' yeast, 0.5 percent malt sugar, 3 percent dried kelp, 0.5 percent calcium carbonate (limestone), 0.5 percent bone meal, 0.125 percent charcoal, 0.125 percent salt, 0.00312 percent potassium iodide, 0.25 percent fortified cod liver oil, 0.25 percent shark liver oil, 0.25 percent wheat germ oil."

It was thus indicated that some ingredients of the pellets inhibited the therapeutic action of sulfanilamide. Because of the complex nature of this food, further experiments were undertaken with simplified diets similar to those used by Dr. Smith in his experiments upon rats (*3*).

Experiments were carried out with the following diets:

	A	*B*	*C*	*D*	*E*
Starch	96	78	91	86	63
Casein, purified	0	18	0	0	18
Brewers' yeast, dried [3]	0	0	5	0	5
Cod liver oil	0	0	0	2	2
Olive oil	0	0	0	8	8
Salt mixture [3]	4	4	4	4	4

After a preliminary period of 4 days upon these diets, groups of 20 mice were inoculated intraperitoneally with an 18-hour streptococcus culture. Sulfanilamide, 0.5 gm. per kilo, was administered subcutaneously immediately after inoculation, and repeated in 24 hours. The above diets were replaced by pellets 3 days after the last dose of sulfanilamide. The results (table 1, fig. 1) showed considerably higher mortalities among the animals on diets B and E, containing casein, than among those on the diets of starch plus the other ingredients.

A further comparison was made between the protein-free diet (A), the 21 percent protein diet (E), and the pellet diet containing approximately 25 percent protein. The mortality on diet A was 16.7 percent as compared with 60 percent on diet E and 84 percent on pellets (table 1, figure 2).

Experiments were next carried out in which the amounts of casein and starch were varied. The following diets were employed:

	No. 0	No 6	No. 18	No. 54
Starch	86	80	68	32
Casein, purified	0	6	18	54
Cod liver oil	2	2	2	2
Olive oil	8	8	8	8
Salt mixture	4	4	4	4

To each 100 gm. of the above diets were added the following vitamins: B_1 0.025 mg., riboflavin 0.1 mg., nicotinic acid 2.5 mg., B_6 0.05 mg., cevitamic acid 2.5 mg.

After a preliminary period of 5 days on the above diets, therapeutic experiments were carried out. The therapeutic activity of sulfanilamide varied inversely with the casein content (table 2). The mice in this experiment were immature, and those on the protein-free diet 0 were in poor condition at the beginning of the therapeutic test. Several died with negative blood and peritoneal smears and

[3] The brewers' yeast contained 60 percent protein. The salt mixture was McCollum's No. 185 (*7*).

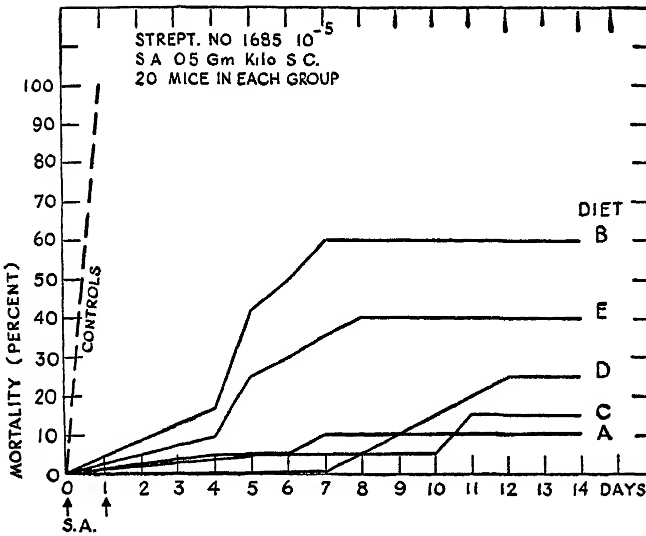


Figure 1.—Therapeutic results with sulfanilamide in mice on diet E and on diets consisting of starch plus various ingredients of diet E. The controls received no therapy and were on a pellet diet.

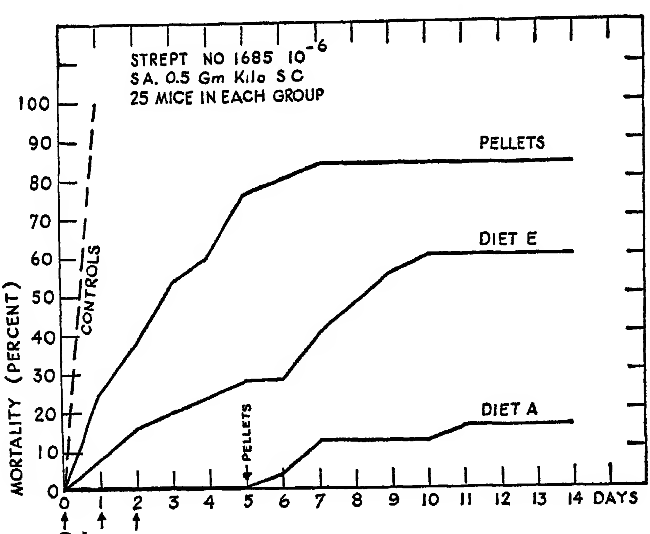


Figure 2.—Comparison of therapeutic response to sulfanilamide in mice on a protein-free diet (A), on an 15 percent casein diet (E), and on pellets.

were excluded from the test since death was not due to the bacterial infection.

This experiment was repeated with essentially similar results, employing commercial casein (not purified) and omitting the addition of synthetic vitamins (table 2, fig. 3). A group of animals fed upon a diet of pellets was also included in this experiment. The mortality

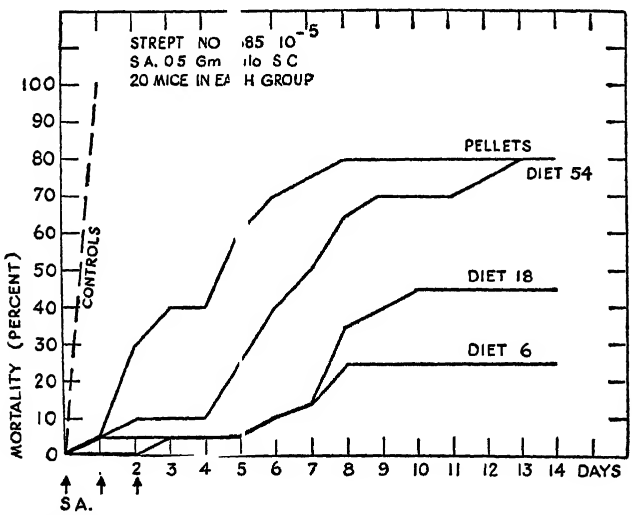


FIGURE 3.—Effect of varying the amount of protein on the therapeutic response to sulfanilamide. Diet numbers refer to casein content.

was similar to that with diet 54, although the pellet diet was slightly more antagonistic than diet 54 as shown by the mean survival time. These results, along with other comparisons made above, indicate that the antagonistic action of the pellet diet, as compared with the casein diet, is out of proportion to the protein content. Either the nature of the protein, or other ingredients in the pellet diet, must play a part in this effect.[4] Only a small percentage of the protein in pellets is present as casein.

[4] Quantitative studies of food intake indicate that this difference may largely be due to greater food consumption on the pellet diet.

TABLE 2.—*Antagonism of therapeutic effect of sulfanilamide by high protein diets. The diet numbers refer to the percentage of casein (see text). In the upper experiment commercial casein was used. In the lower, purified casein plus vitamin supplements were employed. Three daily doses of sulfanilamide in upper, 4 in lower experiment. Diets continued 3 additional days*

Diet No.	Number of mice	Mean weight		Mean daily food intake	Streptococcus No. 1685, dilution of culture	Deaths in days											Mortality, percent
		At onset	At inoculation			1	2	3	4	5	6	7	8	9	10	11–14	
		gm.	*gm.*	*gm.*													
6	20	26.19	26.6	4.8	10^{-6}	----	----	----	----	1	2	----	2	----	----	----	25
18	20	26 0	26 5	4 4	----	1	----	----	----	----	2	----	4	----	2	----	45
54	20	26 42	26 2	2.83	----	1	1	----	----	5	2	1	3	1	----	2	80
Pellets	20	24.9	25.66	----	----	1	5	2	1	3	3	1	----	----	----	----	80
0	20	17.2	14 05	3.0	2×10^{-8}	----	----	----	4	----	----	----	----	----	1	----	25
6	25	15 86	15 2	3.2	----	----	1	----	----	----	1	2	----	1	----	----	20
18	24	16 27	17.3	3 32	----	----	9	1	----	----	----	----	2	4	----	----	66.6
54	24	16.8	16.5	2.58	----	1	13	3	2	----	1	----	----	----	----	----	83.3

MECHANISM OF THE DIETARY INFLUENCE

The exact nature of the influence of diet upon the therapeutic activity of sulfanilamide remains to be clarified. The above results indicate that the protein fraction of the diet is involved in the antagonism, and several experiments were undertaken to throw further light upon the basis of this effect.

Resistance of the host to infection.—The virulence of streptococcus No. 1685 was tested upon a group of mice that had been fed a protein-free diet (0) for 5 days and upon a similar group fed pellets. No differences in susceptibility to infection were seen.

Dilution of culture	Number of mice in each group	Mortality	
		Diet 0	Pellets
		Percent	*Percent*
10^{-6}	4	100	100
10^{-7}	8	87	100
10^{-8}	8	100	87
10^{-9}	8	37	25

Delayed action of sulfanilamide.—The possibility that sulfanilamide might induce more prolonged effect in animals upon a low protein diet was next investigated. Groups of mice on pellets and on diet 0 for 5 days were given 0.5 gm. per kilo of sulfanilamide subcutaneously

and then inoculated 24 and 48 hours later with streptococcus No. 1685, 10^{-6} dilution.

Diet	Interval following administration of sulfanilamide	Number of mice	Deaths in days		
			1	2	3
	Hours				
No. 0	24	10	7	3	
Pellets	24	10	10		
No. 0	48	10	4	4	1
Pellets	48	10	8	2	

The effects of the drug largely disappear, although some prolongation of the survival time is seen for at least 48 hours after the administration of sulfanilamide in those animals on the low protein diet as compared with those on pellets.

Sulfanilamide in the blood and urine.—Sulfanilamide was determined in mice following the technique of Marshall and Cutting (*8*). For animals under test, where the sacrifice of the animal was not desired, determinations were carried out upon 0.02 cc. of blood obtained from the tail.

In other experiments carried out with animals not infected with streptococci, groups of 6 were kept in small metabolism cages; the urines were collected at intervals following the injection of sulfanilamide, and macro determinations of the drug in the blood were made upon samples obtained by decapitation.

Confirmatory of the results of Smith et al. (*3*) in rats, consistently higher concentrations of sulfanilamide were observed in the blood of mice upon the protein-free diet (tables 3 and 4). Eighteen determinations of free sulfanilamide in three groups of mice on diet 0 gave an average concentration at 6 hours after the drug of 14.8 mg. percent (standard deviation $\pm$ 3.464, standard error $\pm$ 0.816), as compared with 6.23 mg. percent (standard deviation $\pm$ 2.738, standard error $\pm$ 0.645) on the pellet diet. In the sacrifice experiments sufficient blood was obtained to estimate total sulfanilamide and to obtain accurate values for the 24-hour interval. On diet 0 at 24 hours after the drug (12 mice) the free sulfanilamide in the blood averaged 0.52 mg. percent and the total (free plus acetylated) averaged 1.34 mg. percent as compared with 0.17 and 0.63 mg. percent, respectively, in the mice on pellets. The degree of acetylation in the animals on pellets was slightly greater than on diet 0, but insufficient to account for the large differences in concentration. This was substantiated by the results with urinary excretion.

TABLE 3.—*Sulfanilamide in the blood of mice with different diets under therapeutic test. Determinations upon 0.02 cc. of blood from tail. Mean values given in*

Interval, in hours, after sulfanilamide administration	Number of mice	Blood sulfanilamide (free), mg. percent	
		Diet A	Diet E
2	6	29 4-46 4 (34.4)	25.4-39.4 (29 6)
6	6	7.4-12 9 (10.8)	5 0-11.4 (8.4)
24	6	1.4-5.4 (2.8)	0 4-1.4 (0.8)
		Diet 0	Pellets
6	6	9.4-16 8 (15)	3.4-9 4 (7.4)
24	6	(1)	(1)
6	6	7.8-15 4 (13.1)	2.8-6.4 (5.1)
24	6	(1)	(1)

1 Traces.

In three groups of 6 mice each on diet 0, the urinary excretion at 6 hours averaged 36.8 percent free and 45.3 percent total sulfanilamide, as compared with 39.6 and 49.4 percent, respectively, for animals on pellets. The 24-hour excretion in two groups of mice on diet 0 averaged 55.3 percent free and 70.2 percent total sulfanilamide as compared with 47.3 percent free and 67.7 percent total, on a diet of pellets (table 4).

TABLE 4.—*Sulfanilamide in the blood and urine of normal mice on a protein-free diet (0) for 5 days and mice on pellets. Blood obtained by decapitation. Individual determinations upon the blood in upper group, with mean values in parentheses. Pooled blood used in the lower experiment*

Diet	Interval, in hours, after sulfanilamide administration	Number of mice	Sulfanilamide in urine		Sulfanilamide in blood, mg. percent	
			Free	Total	Free	Total
			Percent	*Percent*		
0	6	6	28	40	9-23 (15.6)	12-25 (19)
Pellets	6	6	40	45	2.5-12.5 (5.6)	3.9-18 (7.7)
0	6	6	38	44.3		
0	6	6	44.3	51 6		
Pellets	6	6	41.6	55.5		
Pellets	6	6	36	48.3		
0	24	6	51.3	65.9	0.6	1.5
0	24	6	59 3	74.6	.45	1.18
Pellets	24	6	50 6	72.1	.2	.66
Pellets	24	6	44	63.3	.15	.6

From the evidence at hand the higher concentrations of sulfanilamide in the blood in mice on low protein diets cannot be accounted for by either decreased acetylation or delayed excretion.[5]

Explanation of the above results must await further investigation of dietary influence upon the absorption, excretion, and fate in the body of sulfanilamide. While the concentration of the drug in the blood must be an important factor in these results, it is believed that substances inhibitory to the action of sulfanilamide may also be involved. The work of Smith (*3*) has shown that sulfanilamide is more toxic in rats upon a low protein diet. The factor of drug toxicity cannot therefore be involved in the decreased mortality observed upon low protein diets. It must be remembered, however, that low protein diets may be associated with potential increases in toxicity of the drug. Further investigation must establish whether the same constituent of the proteins is responsible for both effects.

Apart from any therapeutic significance these experiments emphasize the desirability of standardization of the diet in the evaluation of chemotherapeutic agents. This influence may be an important factor in the discordant results often obtained in different laboratories, as well as the variations encountered in the same laboratory.

SUMMARY

Wide variations in the therapeutic response to sulfanilamide can be produced in mice by alterations in the diet.

A study of dietary constituents indicates that the protein fraction is important in the inhibition of the action of sulfanilamide.

Mice on a diet deficient in proteins have shown higher concentrations of sulfanilamide in the blood.

REFERENCES

(*1*) Rosenthal, S. M.: Studies in chemotherapy. VIII. Some toxic effects of repeated administration of sulfanilamide and sulfanilyl-sulfanilamide to rabbits and chickens. Pub. Health Rep., **54**:95 (1939).

(*2*) Marshall, E. K., Jr., and Litchfield, J. T.: Some aspects of the pharmacology of sulfapyridine. J. Pharm. and Exp. Therap., **67**:454 (1939).

(*3*) Smith, M. I., Lillie, R. D., and Stohlman, E. F.: The influence of dietary protein on the toxicity of sulfanilamide. Pub. Health Rep., **56**:24 (1941).

(*4*) Lockwood, J. S., and Lynch, H. M.: Mechanism of action of sulfanilamide. J. Am. Med. Assoc., **114**:935 (1940).

(*5*) Woods, D. D.: The relation of p-aminobenzoic acid to the mechanism of action of sulfanilamide. Brit. J. Exp. Path., **21**:74 (1940).

(*6*) Selbie, F. R.: The inhibition of action of sulfanilamide in mice by p-aminobenzoic acid. Brit. J. Exp. Path., **21**:90 (1940).

---

[5] By adapting a micro technique for the determination of phenolsulfonephthalein in the serum it was shown that a delay in removal of this dye from the blood (see Rosenthal, S M Proc. Soc Exp. Biol. and Med., 21:72 (1923)) was apparent in normal mice after 4 days upon diet No 6, becoming pronounced on the sixth day. This indicates that altered renal function is an important factor in the retention of sulfanilamide on low protein diets.

(7) McCollum, E. V., and Davis, M.: The essential factors in the diet during growth. J. Biol. Chem., **23**:235 (1915).
(8) Marshall, E. K., Jr., and Cutting, W. C.: Absorption and excretion of sulfanilamide in the mouse and rat. Bull. Johns Hopkins Hosp., **63**:328 (1938).

DEATHS DURING WEEK ENDED SEPTEMBER 6, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Sept. 6, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,404	7,288
Average for 3 prior years	7,031	
Total deaths, first 36 weeks of year	305,575	306,219
Deaths per 1,000 population, first 36 weeks of year, annual rate	11.9	11.9
Deaths under 1 year of age	521	441
Average for 3 prior years	468	
Deaths under 1 year of age, first 36 weeks of year	18,827	17,979
Data from industrial insurance companies:		
Policies in force	64,453,029	64,915,823
Number of death claims	7,521	8,420
Death claims per 1,000 policies in force, annual rate	6.3	6.8
Death claims per 1,000 policies, first 36 weeks of year, annual rate	9.6	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control diseases without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED SEPTEMBER 13, 1941

Summary

A slight increase in the incidence of poliomyelitis was recorded for the current week, with 595 cases reported as compared with 584 for the preceding week. The largest increases were recorded for the New England States (27 to 48) and the Middle Atlantic (169 to 213), and the largest decreases were reported for the East South Central (132 to 86), South Atlantic (115 to 80), and West North Central States (36 to 28).

The following listed 13 States reported 15 or more cases during the current week (last week's figures in parentheses): New York, 109 (71)—53 in New York City and 56 in the State outside New York City; Pennsylvania, 63 (66); New Jersey, 41 (32); Alabama, 38 (66); Ohio, 35 (33); Tennessee, 29 (38); Georgia, 26 (49); Illinois, 25 (21); Minnesota, 24 (23); Michigan, 20 (7); Connecticut, 19 (6); Maryland, 17 (16); Massachusetts, 16 (18). Last week also 13 States reported 15 or more cases, but for the current week Virginia and Kentucky dropped out of the group while Connecticut and Michigan were added.

To date this year (first 37 weeks) a total of 5,204 cases of poliomyelitis has been reported in the United States, as compared with 6,391 in 1937 and 4,856 in 1940 for the corresponding period.

Of a total of 882 cases of influenza reported for the current week, 530 cases occurred in Texas. While the incidence of the disease during the past summer has not been alarmingly high, it has been continuously above the 5-year (1936–40) median, due entirely to the large number of cases reported in Texas, which has accounted for about 41 percent of the total for the country as a whole.

Encephalitis continued to decline in all of the West North Central States where the disease has been epidemic during the past summer.

No cases of Rocky Mountain spotted fever were reported in the Mountain States during the current week, while 6 cases were reported in States east of that area.

Of 136 cases of endemic typhus fever, 56 occurred in Georgia, 23 in Texas, 16 in Louisiana, 13 in Florida, and 10 in Alabama. A total of 1,615 cases has been reported this year to date, as compared with 1,247 from January to September, inclusive, in 1940 and 2,140 for the same period in 1939.

The death rate for the current week in 88 large cities in the United States was 10.4 per 1,000 population, the same as for the preceding week. The 3-year (1938–40) average for the corresponding period is 10.3.

Telegraphic morbidity reports from State health officers for the week ended September 13, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936-40	Week ended—		Median 1936-40	Week ended—		Median 1936-40	Week ended—		Median 1936-40
	Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940	
NEW ENG.												
Maine	0	1	1	1	------	------	25	12	1	0	1	0
New Hampshire	0	0	0	------	------	------	2	0	2	0	0	0
Vermont	0	1	1	------	------	------	4	0	0	0	1	0
Massachusetts	4	0	2	------	------	------	33	65	22	3	1	1
Rhode Island	0	0	0	------	------	------	9	0	2	0	0	0
Connecticut	0	0	2	1	3	1	6	4	4	1	0	0
MID. ATL.												
New York [1]	8	7	10	[2] 0	[2] 5	[2] 5	81	77	60	5	8	7
New Jersey	1	3	3	4	------	4	19	33	20	1	0	0
Pennsylvania	12	7	17	1	------	------	61	35	33	2	1	3
E. NO. CEN.												
Ohio	10	4	14	4	12	12	23	13	13	0	0	1
Indiana [3]	1	2	10	4	3	8	2	5	3	0	0	0
Illinois [1 3]	17	14	18	------	1	5	35	15	15	1	3	1
Michigan [4]	4	0	7	------	2	1	73	44	14	0	0	1
Wisconsin	0	0	2	7	21	20	77	61	40	1	3	1
W. NO. CEN.												
Minnesota	4	1	2	1	1	1	0	1	6	0	0	0
Iowa [3]	1	2	2	4	3	------	10	18	4	0	0	0
Missouri	3	1	13	------	2	2	4	2	3	0	1	1
North Dakota	1	1	1	------	------	2	0	0	2	0	0	0
South Dakota	3	1	1	------	------	------	0	1	1	0	0	0
Nebraska	0	0	1	------	------	------	2	1	2	0	0	0
Kansas	3	7	7	2	1	1	3	14	8	1	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	0	2	------	1	0	0
Maryland [1 3 4]	1	2	4	2	2	2	11	2	5	0	0	1
Dist. of Col.	1	2	2	------	------	------	3	0	0	0	0	0
Virginia	6	8	33	60	47	------	15	10	7	1	0	1
West Virginia [4]	5	6	10	5	11	13	29	3	3	0	3	3
North Carolina [1]	40	26	72	------	2	1	10	3	4	0	1	1
South Carolina [1]	36	9	18	123	148	119	32	4	7	2	0	0
Georgia [1]	24	16	30	7	2	------	16	1	------	0	0	0
Florida [1]	1	3	8	7	2	------	4	1	3	0	0	0
E. SO. CEN.												
Kentucky	7	13	13	------	5	5	29	3	12	1	0	0
Tennessee [1 3]	10	5	22	10	3	9	13	10	4	1	1	1
Alabama [1]	19	20	31	3	6	8	5	2	2	1	0	2
Mississippi [1 4]	9	12	15	------	------	------	------	0	------	0	0	1
W. SO. CEN.												
Arkansas	11	12	17	2	1	3	28	1	1	0	0	0
Louisiana [1]	5	8	8	3	2	2	7	0	0	1	0	1
Oklahoma	13	8	8	9	44	16	6	1	1	1	0	1
Texas [1 4]	38	14	33	530	79	79	48	22	20	1	0	1
MOUNTAIN												
Montana	0	1	1	------	2	------	3	3	5	0	1	1
Idaho	0	0	1	------	------	------	2	0	3	0	0	0
Wyoming	0	1	1	4	------	------	3	0	0	0	0	0
Colorado	14	3	3	19	1	------	5	3	3	0	0	0
New Mexico	0	4	2	1	2	------	2	1	1	0	0	0
Arizona	0	0	2	36	13	18	52	16	2	1	0	0
Utah [4]	0	2	0	------	------	------	1	6	6	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	3	0	------	------	------	7	8	10	1	1	0
Oregon	3	2	1	6	6	9	8	16	7	0	0	0
California	11	17	17	21	12	12	74	42	38	1	1	0
Total	326	249	504	882	444	385	918	561	561	28	27	35
37 weeks	8,750	9,707	15,435	602,525	170,891	153,176	833,999	231,174	271,581	1,541	1,262	2,285

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 13, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940		Sept. 13, 1941	Sept. 14, 1940	
NEW ENG.												
Maine	3	1	1	6	8	5	0	0	0	4	3	1
New Hampshire	7	0	0	3	2	1	0	0	0	1	0	0
Vermont	1	2	1	1	3	3	0	0	0	1	1	0
Massachusetts	16	4	4	59	37	34	0	0	0	5	1	5
Rhode Island	2	1	1	4	1	1	0	0	0	0	0	0
Connecticut	19	3	1	10	11	11	0	0	0	1	3	4
MID. ATL.												
New York [1]	109	14	14	72	72	72	0	0	0	30	16	21
New Jersey	41	3	3	15	24	16	0	0	0	7	5	11
Pennsylvania	63	14	14	40	44	73	0	0	0	24	22	37
E. NO. CEN.												
Ohio	35	53	18	49	52	80	0	1	0	14	8	23
Indiana [3]	7	58	6	12	14	30	1	0	2	2	8	9
Illinois [1 2]	25	59	52	44	100	94	0	0	0	6	12	20
Michigan [4]	20	160	57	47	55	59	2	0	0	7	3	10
Wisconsin	6	31	4	52	37	39	3	0	0	9	0	1
W. NO. CEN.												
Minnesota	24	9	9	11	16	23	0	0	0	2	4	2
Iowa [3]	0	100	12	10	25	24	0	1	1	5	1	2
Missouri	1	36	5	8	15	25	1	0	0	6	10	25
North Dakota	1	2	0	1	0	4	0	8	0	0	1	1
South Dakota	0	7	2	7	3	13	0	3	1	3	0	1
Nebraska	1	14	5	8	1	10	0	0	1	0	0	0
Kansas	1	49	5	44	32	31	0	0	0	3	10	10
SO. ATL.												
Delaware	0	0	0	8	4	3	0	0	0	0	0	1
Maryland [1 3 4]	17	1	1	16	6	13	0	0	0	9	4	11
Dist. of Col.	3	0	1	11	3	5	0	0	0	0	1	1
Virginia	11	16	3	5	13	13	0	0	0	14	21	18
West Virginia [4]	2	48	2	16	16	30	0	0	0	8	8	16
North Carolina [1]	9	10	3	40	46	46	0	0	0	17	13	13
South Carolina [1]	8	2	1	8	9	9	0	0	0	5	15	15
Georgia [1]	26	4	4	8	12	12	0	0	0	18	13	13
Florida [1]	4	2	1	2	1	2	0	0	0	4	4	4
E. SO. CEN.												
Kentucky	14	10	4	25	25	31	0	0	0	13	23	30
Tennessee [1 3]	29	4	1	32	26	25	2	0	0	5	20	16
Alabama [1]	38	1	3	18	15	15	0	0	0	7	12	12
Mississippi [1 4]	5	3	4	11	11	8	0	0	0	8	9	9
W. SO. CEN.												
Arkansas	5	1	1	1	11	6	1	0	0	15	26	17
Louisiana [1]	1	3	1	2	1	4	0	0	0	20	13	15
Oklahoma	2	8	2	10	10	12	0	1	1	11	12	23
Texas [1 4]	4	8	8	20	12	24	0	0	0	35	47	49
MOUNTAIN												
Montana	2	4	1	9	11	11	0	0	2	2	2	3
Idaho	1	3	1	3	0	2	0	0	0	0	12	4
Wyoming	0	2	1	1	1	3	0	0	0	0	2	1
Colorado	6	4	4	14	13	9	0	0	2	4	7	6
New Mexico	1	2	2	1	2	6	0	0	0	3	3	10
Arizona	0	0	0	1	2	2	0	0	0	1	0	3
Utah [4]	3	5	4	1	8	13	0	0	0	0	1	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	8	12	2	9	10	13	0	0	2	2	1	5
Oregon	6	4	2	2	3	10	0	0	0	3	2	5
California	8	14	14	42	55	72	0	0	1	3	10	10
Total	595	797	501	819	884	1,022	10	14	42	337	389	559
37 weeks	5,204	4,856	3,946	94,578	121,688	140,899	1,207	2,002	8,154	5,836	6,636	9,268

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 13, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Sept. 13, 1941	Whooping cough, Week ended— Sept. 14, 1940
NEW ENG.		
Maine	6	27
New Hampshire	4	0
Vermont	0	1
Massachusetts	194	130
Rhode Island	47	1
Connecticut	41	25
MID. ATL.		
New York [1]	319	255
New Jersey	192	135
Pennsylvania	216	336
E. NO. CEN.		
Ohio	317	220
Indiana [3]	12	31
Illinois [1 3]	237	112
Michigan [4]	340	285
Wisconsin	239	127
W. NO. CEN.		
Minnesota	31	57
Iowa [3]	27	17
Missouri	20	41
North Dakota	5	4
South Dakota	19	9
Nebraska	2	2
Kansas	97	33
SO. ATL.		
Delaware	2	12
Maryland [1 3 4]	39	65
Dist. of Col.	24	4
Virginia	44	56
West Virginia [4]	11	38
North Carolina [1]	83	86
SO. ATL.—continued		
South Carolina [1]	69	26
Georgia [1]	5	7
Florida [1]	8	1
E. SO. CEN.		
Kentucky	71	79
Tennessee [1 3]	53	29
Alabama [1]	25	11
Mississippi [1 4]	-------	-------
W. SO. CEN.		
Arkansas	18	5
Louisiana [1]	2	6
Oklahoma	20	8
Texas [1 4]	127	96
MOUNTAIN		
Montana	44	8
Idaho	17	0
Wyoming	20	1
Colorado	75	15
New Mexico	25	6
Arizona	14	3
Utah [4]	33	22
Nevada	24	------
PACIFIC		
Washington	76	53
Oregon	29	11
California	223	228
Total	3, 555	2, 724
37 weeks	159, 503	117, 570

[1] Typhus fever, week ended Sept. 13, 1941, 136 cases, as follows: New York, 1; Illinois, 1; Maryland, 1; North Carolina, 3; South Carolina, 4; Georgia, 56; Florida, 13; Tennessee, 2; Alabama, 10; Mississippi, 6; Louisiana, 16, Texas, 23.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended Sept. 13, 1941, 6 cases, as follows: Indiana, 1; Illinois, 1; Iowa, 2; Maryland, 1; Tennessee, 1.
[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended August 30, 1941

This table lists the reports from 128 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	1	0	0	1	0	6	21
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	7
Manchester	0	------	0	0	0	2	0	0	0	0	19
Nashua	0	------	0	0	0	0	0	0	0	0	8
Vermont:											
Burlington	0	------	0	0	0	0	0	0	0	0	7
Rutland	0	------	0	0	0	0	0	0	0	0	9
Massachusetts:											
Boston	0	------	0	10	3	18	0	8	0	31	157
Fall River	0	------	0	0	0	1	0	0	0	2	27
Springfield	0	------	0	1	0	2	0	0	0	5	27
Worcester	0	------	0	4	5	2	0	1	0	6	49
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	15
Providence	1	------	0	3	0	3	0	1	0	12	48
Connecticut:											
Bridgeport	0	------	0	0	1	1	0	1	0	2	29
Hartford	0	------	0	3	0	1	0	0	0	0	25
New Haven	0	------	0	5	1	0	0	0	0	3	42
New York:											
Buffalo	0	------	0	0	8	3	0	2	0	19	115
New York	9	------	0	20	25	32	0	64	7	154	1,203
Rochester	0	------	0	0	0	0	0	0	0	3	63
Syracuse	0	------	0	3	1	0	0	1	0	28	44
New Jersey:											
Camden	0	------	0	0	0	2	0	0	0	0	24
Newark	0	1	0	1	5	8	0	2	0	37	81
Trenton	0	------	0	1	0	1	0	2	0	0	34
Pennsylvania:											
Philadelphia	3	------	2	6	8	19	0	10	3	41	364
Pittsburgh	0	------	0	0	4	2	0	7	1	28	144
Reading	0	------	0	0	0	1	0	0	0	1	25
Scranton	0	------	------	0	------	0	0	------	0	0	------
Ohio:											
Cincinnati	1	------	0	0	1	5	0	1	0	5	92
Cleveland	0	4	0	1	1	6	0	8	1	56	156
Columbus	0	------	0	2	0	1	0	1	0	20	78
Toledo	0	------	0	3	1	3	0	0	2	39	59
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	6
Fort Wayne	0	------	0	0	1	0	0	1	0	0	16
Indianapolis	1	------	0	0	2	2	0	5	0	3	105
Muncie	0	------	0	1	2	0	0	0	0	0	8
Terre Haute	0	------	0	0	1	0	0	2	0	0	16
Illinois:											
Alton	0	------	0	0	0	0	0	0	2	0	8
Chicago	5	1	0	4	10	14	0	33	2	140	535
Elgin	0	------	0	0	1	0	0	0	0	4	14
Springfield	0	------	0	1	1	0	0	1	0	0	22
Michigan:											
Detroit	2	------	0	21	9	10	0	12	1	47	197
Flint	0	------	0	0	1	0	0	0	0	3	17
Grand Rapids	0	------	0	0	1	1	0	0	0	9	38
Wisconsin:											
Kenosha	0	------	0	0	0	0	0	0	0	9	5
Madison	0	------	0	9	0	0	0	0	0	5	19
Milwaukee	0	1	1	8	1	6	0	1	0	151	90
Racine	0	------	0	2	0	1	0	0	0	5	14
Superior	0	------	0	0	0	0	0	0	0	0	5
Minnesota:											
Duluth	0	------	0	0	1	2	0	0	0	8	23
Minneapolis	0	------	0	0	1	4	0	0	0	5	82
St. Paul	0	------	0	1	3	0	0	1	0	15	55
Iowa:											
Des Moines	0	------	------	1	------	0	0	------	0	2	26
Sioux City	0	------	------	0	------	0	0	------	0	2	------
Waterloo	0	------	------	1	------	0	0	------	0	5	------

City reports for week ended August 30, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0		0	1	1	4	0	3	1	1	87
St. Joseph	0		0	0	2	0	0	1	0	0	10
St. Louis	1		0	2	4	4	0	10	0	23	169
North Dakota:											
Fargo	0		0	0	0	0	0	1	0	0	12
Grand Forks	0			0		0	0		0	0	
Minot	0			1		0	0		0	1	6
South Dakota:											
Aberdeen	0			0		2	0		0	1	
Nebraska:											
Lincoln	0			0		0	0		0	3	
Omaha	0		0	1	0	0	0	0	1	0	31
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	0	1
Topeka	0		0	0	1	5	0	1	0	10	13
Wichita	0		0	0	2	3	0	0	1	4	28
Delaware:											
Wilmington	0		0	0	0	2	0	0	0	1	27
Maryland:											
Baltimore	0	2	0	10	6	7	0	8	4	50	187
Cumberland	0		0	0	0	0	0	0	0	0	13
Frederick	0		0	0	0	0	0	0	0	0	
Dist. of Col.:											
Washington	1		0	6	7	6	0	10	1	15	138
Virginia:											
Lynchburg	0		0	0	0	1	0	0	0	0	9
Norfolk	1		0	0	2	0	0	0	0	1	33
Richmond	1		0	1	3	0	0	2	0	0	43
Roanoke	0		0	0	0	0	0	1	0	0	13
West Virginia:											
Charleston	0		0	0	2	0	0	1	0	1	20
Huntington	0			2		0	0		1	1	
Wheeling	0		0	2	1	0	0	0	0	4	23
North Carolina:											
Gastonia	0			0		1	0		0	1	
Raleigh	0		0	1	0	1	0	2	0	12	13
Wilmington	0		0	0	3	0	0	1	0	9	11
Winston-Salem	0		0	1	0	0	0	0	0	2	25
South Carolina:											
Charleston	0		0	0	1	0	0	0	2	1	14
Florence	0			0		0	0		0	0	
Greenville	1		0	0	0	0	0	0	0	1	14
Georgia:											
Atlanta	0		0	2	3	4	0	4	0	4	60
Brunswick	0		0	0	0	0	0	0	0	0	2
Savannah	0		0	2	0	0	0	1	0	0	23
Florida:											
Miami	0	1	1	1	0	0	0	1	1	3	47
St. Petersburg	0		1	0	8	0	0	0	0	0	19
Tampa	0	1	0	0	1	0	0	2	0	0	17
Kentucky:											
Ashland	0		0	0	0	0	0	0	1	1	9
Covington	0		0	0	0	1	0	1	0	0	10
Lexington	0		0	0	0	0	0	3	1	6	13
Tennessee:											
Knoxville	2		1	0	0	0	0	1	0	0	23
Memphis	0		2	1	7	1	0	4	0	9	67
Nashville	0		0	0	1	2	0	3	0	17	35
Alabama:											
Birmingham	1		0	0	2	0	0	3	2	1	55
Mobile	1		1	1	0	0	0	0	0	0	26
Montgomery	0			0		1	0		0	2	
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0		0	0	0	0	0	2	0	0	23
Louisiana:											
Lake Charles	0		0	0	0	0	0	0	0	0	2
New Orleans	0		0	0	12	0	0	15	0	0	164
Shreveport	0		0	0	7	1	0	2	0	0	65
Oklahoma:											
Oklahoma City	0		0	0	1	0	0	0	0	1	36
Tulsa	0		0	0	0	2	0	0	0	0	9
[illegible]											
Dallas	1		0	8	0	1	0	2	0	10	53
Galveston	0		0	0	0	0	0	1	0	0	17
Houston	2		0	1	4	0	0	4	1	0	78
San Antonio	0		0	1	6	2	0	9	0	0	51

City reports for week ended August 30, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Montana:											
Billings	0	------	0	0	1	0	0	0	0	3	4
Great Falls	0	------	0	0	0	0	0	0	0	2	12
Helena	0	------	0	0	0	0	0	0	0	2	9
Missoula	0	------	0	0	1	0	0	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	1	0	0	0	1	0	7	14
Denver	0	12	0	5	2	2	0	3	0	51	85
Pueblo	0	------	0	0	0	3	0	0	0	0	11
New Mexico:											
Albuquerque	0	------	0	0	1	0	0	1	0	0	7
Arizona:											
Phoenix	0	3	--------	0	-------	0	0	-------	0	1	--------
Utah:											
Salt Lake City	0	------	0	1	1	2	0	0	0	16	29
Washington:											
Seattle	0	------	1	0	1	1	0	3	2	25	70
Spokane	0	------	0	1	0	2	0	0	0	7	28
Tacoma	0	------	0	0	0	0	0	1	0	3	28
Oregon:											
Portland	0	------	0	0	1	1	0	0	0	4	66
Salem	0	------	--------	0	-------	0	0	-------	0	2	--------
California:											
Los Angeles	3	5	0	40	4	7	0	18	1	35	340
Sacramento	0	------	0	2	2	0	0	3	0	0	35
San Francisco	0	------	0	2	2	2	0	5	0	11	160

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	0	0	10
Worcester	0	0	1
Rhode Island:			
Providence	0	0	3
Connecticut:			
Bridgeport	0	0	2
New Haven	0	0	1
New York:			
New York	1	0	47
Rochester	0	0	5
Pennsylvania:			
Philadelphia	0	0	6
Pittsburgh	0	0	1
Scranton	0	0	1
Ohio:			
Cincinnati	0	0	1
Cleveland	0	0	20
Indiana:			
South Bend	0	0	1
Terre Haute	0	0	1
Illinois:			
Chicago	1	0	13
Michigan:			
Detroit	0	0	13
Wisconsin:			
Superior	0	0	2
Minnesota:			
Duluth	0	0	1
Minneapolis	0	0	4
St. Paul	0	0	12
South Dakota:			
Aberdeen	0	0	1
Maryland:			
Baltimore	1	0	14
District of Columbia:			
Washington	0	0	8
Virginia:			
Norfolk	0	0	1
Richmond	1	0	0
Roanoke	1	0	0
West Virginia:			
Huntington	0	0	1
Wheeling	0	1	0
Georgia:			
Atlanta	1	1	3
Florida:			
Tampa	0	0	1
Tennessee:			
Nashville	0	0	4
Alabama:			
Birmingham	0	0	4
Montgomery	0	0	3
Arkansas:			
Little Rock	0	0	1
Texas:			
Houston	1	0	0
Montana:			
Billings	0	0	1
Colorado:			
Pueblo	1	0	0
Utah:			
Salt Lake City	0	0	5
Oregon:			
Portland	0	0	2
California:			
Los Angeles	0	0	2
Sacramento	0	0	1

Sioux City, 1; Aberdeen, 1; Omaha, 2; Topeka, 1; Denver, 1.

Pellagra.—Cases: Boston, 1; St. Louis, 1.

Typhus fever.—Cases: Charleston, S. C., 1; Atlanta, 1; Savannah, 8; Birmingham, 1; New Orleans, 3; Ft. Worth, 1. Deaths: Houston, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,790,805)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Sept. 6, 1941	5.1	4.2	1.1	29.2	28.7	31.8	0.0	45.2	4.8	182.5
Average, 1936-40	10.8	4.5	1.6	25.9	39.1	35.4	0.3	50.7	11.1	180.5

PLAGUE INFECTION IN GROUND SQUIRREL AND FLEAS IN SISKIYOU COUNTY, CALIF.

Under date of September 4, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in Siskiyou County, Calif., in organs from 1 ground squirrel, *C. douglasii*, submitted to the laboratory on August 21 from a ranch about 1½ miles northwest of Mount Shasta City, in a pool of 17 fleas from 1 ground squirrel, *C. douglasii*, shot on August 9 on a ranch approximately 3½ miles northeast of Weed, and in another pool of 105 fleas from 5 ground squirrels of the same species taken on August 8 from a ranch about 3¼ miles northwest of Weed.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended August 9, 1941.—During the week ended August 9, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	--------	1	1	5	12	1	1	--------	1	22
Chickenpox	--------	3	--------	13	63	8	8	19	8	122
Diphtheria	1	9	--------	21	4	2	1	--------	--------	38
Dysentery	--------	--------	--------	13	--------	--------	--------	--------	--------	13
Influenza	--------	--------	--------	--------	1	--------	--------	--------	--------	1
Lethargic encephalitis	--------	--------	--------	--------	--------	19	--------	--------	--------	19
Measles	2	31	--------	55	107	4	17	16	17	249
Mumps	--------	--------	--------	36	52	12	10	3	7	120
Pneumonia	--------	1	--------	--------	2	--------	--------	--------	1	4
Poliomyelitis	--------	--------	33	--------	2	153	--------	15	3	206
Scarlet fever	--------	2	3	21	54	3	4	11	8	106
Tuberculosis	3	5	6	50	50	6	12	1	--------	133
Typhoid and paratyphoid fever	1	--------	2	22	15	1	--------	1	3	45
Whooping cough	--------	1	3	125	106	--------	9	1	27	272

Manitoba—Poliomyelitis.—A total of 51 cases of poliomyelitis was reported in the Province of Manitoba, Canada, for the week ended September 12, as compared with 78 cases for the preceding week. This makes a total of 809 cases to date, which is stated to be 60 percent in excess of the number of cases recorded in any previous epidemic in the Province.

The present incidence is reported to have spread from the southern half of the Province, with the exception of a few limited areas in the extreme southwest part, where a high incidence was reported in the epidemic of 1936. The local health authorities are of the opinion that the early appearance of the disease and the accompanying high temperature were factors in the high incidence this year.

Reports state that all suspected cases have been carefully studied and the diagnosis confirmed before they were declared to be positive infections. Paralysis or a degree of muscular weakness subsequently developed in several cases in which the spinal fluid was found to be negative on repeated examinations.

Encephalitis.—During the same week, 22 cases of encephalitis were reported in Manitoba, as compared with 70 for the preceding week,

bringing the total number to date to 431 with 41 deaths. The cases were distributed more or less uniformly over the southern part of the Province, with the incidence increasing toward the southern border. A few cases are now being reported from remote northern areas.

Since the latter part of August, when the temperature dropped precipitately and heavy rains have fallen, there has been a steady decline in cases of both encephalitis and poliomyelitis in Manitoba.

CUBA

Provinces—Notifiable diseases—4 weeks ended August 16, 1941.—During the 4 weeks ended August 16, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer			4	1	1	13	19
Diphtheria		12	4	1	1	4	22
Leprosy		1		1		1	3
Malaria	25	14		19	4	167	229
Measles	1	33					34
Poliomyelitis	1	2				1	4
Rabies		1					1
Scarlet fever		5				1	6
Tetanus, infantile			1				1
Tuberculosis	19	38	26	23	16	47	169
Typhoid fever	26	59	19	47	26	49	226
Undulant fever					1		1
Whooping cough				1		6	7

[1] Includes the city of Habana.

FINLAND

Communicable diseases—June 1941.—During the month of June 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	90	Poliomyelitis	6
Influenza	529	Scarlet fever	244
Paratyphoid fever	55	Typhoid fever	36

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

Brazil—Amazonas State—Manacapuru.—On July 2, 1941, 1 death from yellow fever was reported in Manacapuru, Amazonas State, Brazil.

Public Health Reports

VOLUME 56 SEPTEMBER 26, 1941 NUMBER 39

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE 1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • SEPTEMBER 26, 1941 • *No. 39*

EXECUTIVE ORDER ESTABLISHING THE OFFICE OF DEFENSE HEALTH AND WELFARE SERVICES IN THE EXECUTIVE OFFICE OF THE PRESIDENT AND DEFINING ITS FUNCTIONS AND DUTIES

By virtue of the authority vested in me by the Constitution and statutes of the United States, and in order to define further the functions and duties of the Office for Emergency Management of the Executive Office of the President with respect to the national emergency as declared by the President on May 27, 1941, for the purpose of assuring adequate health and welfare services to meet needs of the national defense program, it is hereby ordered:

1. The term "health and welfare services" as used in this Order means all health, welfare, medical, nutrition, recreation, and related services including those aspects of education under the jurisdiction of the Federal Security Agency.

2. There is established within the Office for Emergency Management of the Executive Office of the President the Office of Defense Health and Welfare Services, at the head of which the Federal Security Administrator shall serve as Director. The Director shall discharge and perform his responsibilities and duties under the direction and supervision of the President. The Director shall receive no salary or other remuneration as such, but shall be entitled to actual and necessary transportation, subsistence, and other expenses incidental to the performance of his duties.

3. Subject to such policies, regulations, and directions as the President may from time to time prescribe, the Office shall:

a. Serve as the center for the coordination of health and welfare services made available by the departments and agencies of the Federal Government, and other agencies, public and private, to meet the needs of State and local communities arising from the defense program; and take necessary steps to secure the cooperation of the appropriate Federal departments and agencies relative thereto.

b. Make available to States and localities, upon request, the services of specialists in health and welfare activities to assist in the planning and execution of such local and State programs.

c. Study, plan, and encourage measures designed to assure the provision of adequate defense health and welfare services to the citizens of the Nation during the period of the emergency, and coordinate studies and surveys made by Federal departments and agencies with respect to these fields.

d. Keep the President informed with respect to progress made in carrying out this Order; and perform such related duties as the President may from time to time assign or delegate to it.

4. The Director may provide for the internal organization and management of the Office of Defense Health and Welfare Services. He shall obtain the President's approval for the establishment of the principal subdivisions of the Office and the appointment of the heads thereof.

5. In the study of problems and in the discharge of its functions and responsibilities it shall be the policy of the Office of Defense Health and Welfare Services to collaborate with and to utilize, insofar as practicable, the facilities and services of existing departments and agencies which perform related functions. Furthermore, it shall be the policy of the Office of Defense Health and Welfare Services in carrying out its functions and duties to work with and through the State and local defense councils and other appropriate State and local agencies, and in this connection to cooperate and work in conjunction with the Office of Civilian Defense in its relationships with State and local groups.

6. There shall be in the Office of Defense Health and Welfare Services a Health and Medical Committee to consist of a Chairman to be appointed by the President, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the United States Public Health Service, the chairman of the Committee on Medical Research of the Office of Scientific Research and Development, and such others as the President may from time to time determine. The Committee shall advise the Director regarding the health and medical aspects of national defense exclusive of medical research and assist in the coordination of health and medical activities affecting national defense. The members of the Committee shall serve as such without compensation but shall be entitled to actual and necessary transportation, subsistence, and other expenses incidental to the performance of their duties.

7. The Director is authorized to appoint such advisory committees and subcommittees, with respect to particular aspects of health, welfare, nutrition, recreation, and related activities as he may find necessary or desirable to assist him in the performance of his duties. Such advisory committees may include representatives from Federal departments and agencies, State and local governments, private organizations, and the public at large. The members of advisory committees shall serve as such without compensation, but shall be entitled to actual and necessary transportation, subsistence, and other expenses incidental to the performance of their duties.

8. Within the limits of such funds as may be appropriated or allocated to the Office of Defense Health and Welfare Services by the President, the Director may employ necessary personnel and make provision for the necessary supplies, facilities and services through the Federal Security Agency. The Office of Defense Health and Welfare Services may use such statistical, informational, fiscal, personnel, and other general business services and facilities as may be made available through the Office for Emergency Management.

FRANKLIN D. ROOSEVELT.

THE WHITE HOUSE,
September 3, 1941.

EPIDEMIC OF INFECTIOUS ENCEPHALITIS

By JAMES P. LEAKE, *Medical Director, United States Public Health Service*

The largest encephalitis epidemic of record has just ended. There have been 1,080 cases and 96 deaths in North Dakota, an incidence of 167 per 100,000 and a fatality rate of 8.9 percent. The incidence

was heavy throughout the whole State except for the extreme western counties. In Minnesota there have been 815 cases with a somewhat lower fatality rate, and with the heaviest incidence in the prairie districts toward North Dakota. In South Dakota there have been 180 cases and 11 deaths, chiefly in the northern and eastern sections. In Manitoba there have been 434 cases and 42 deaths, an incidence of 66 per 100,000 and a fatality rate of 9.7 percent. The part of Saskatchewan toward North Dakota has had a similar heavy incidence. In Montana, on the contrary, there have been 64 cases and 6 deaths since the middle of June, an incidence of only 12 per 100,000. Alberta has been only slightly affected, and in Nebraska there have been about 250 cases and 40 deaths, an incidence of 19 per 100,000, with 16 percent fatality.

These figures are based on reported cases and are influenced by the readiness with which medical attention is sought and with varying practices in diagnosis and reporting.

The terms "lethargic encephalitis" and "epidemic encephalitis" are not suitable for the group of diseases now classified under the name of "infectious encephalitis." Of these diseases, the one described by von Economo and originally called encephalitis lethargica but now termed the Vienna type of infectious encephalitis differed markedly from the present disease as to the outcome in patients recovering from the acute attack. In this epidemic there appears to be practically no danger of the sequelae which made the old "lethargic encephalitis" of the classical description a more terrible disease than poliomyelitis. The difference is very important.

The symptoms have been similar to those described for the St. Louis type of infectious encephalitis [1] and those described by Hammon for the encephalitis in the Yakima Valley [2] but are in general milder.

The primary question was to determine the type of encephalitis present. The type was indicated by neutralization tests performed in the laboratory of the Minnesota Department of Health on serum of patients in the Fargo area, some of these serums neutralizing the western type of equine encephalomyelitis. The accompanying note by Cox, Jellison, and Hughes [3] establishes this firmly by recording the isolation from eight human necropsies of this type of virus, and only this type. The uniformity of symptoms and evenness of spread of the disease throughout the epidemic area was good evidence that only one disease, in the main, accounted for the epidemic. There is some indication that on the fringes of the epidemic, as in Nebraska, the St. Louis type of infectious encephalitis may account for a proportion

[1] Report of the St. Louis outbreak of encephalitis. Public Health Bulletin No. 214, Government Printing Office, Washington, 1935.

[2] Hammon, W. McD.: Encephalitis in the Yakima Valley. J. Am. Med. Assoc., 117: 161–167 (1941).

[3] See page 1905.

of the cases. This is known to be widespread throughout the United States as a human infection.

The most important public health problem was to determine the means of spread. It is known that mosquitoes can transmit this disease. The disease in horses in North Dakota was not particularly severe this year, and much less prevalent than in 1938 when the last epidemic of human encephalitis occurred in this State, of about one-tenth the intensity of this year's epidemic. In 1938 the incidence in horses was, in turn, much less than in 1937 when there was no human outbreak; vaccination of the horses could not account for the reduction of incidence in 1938. In both 1938 and 1941 there was no particular connection, case for case, between cases of the disease in horses and human cases; instances of such possible connection were unusual and the prevalence of the disease in horses antedated the heavy human prevalence by several weeks. There was likewise, in general, little connection by probable contact between human cases. This was a heavy mosquito year in North Dakota on account of the rains, and the epidemic, with the first cases early in July, coincided with mosquito prevalence although the heaviest mosquito infestation was some weeks before the heaviest incidence of the human disease.

The disease was predominantly rural. This was contrasted in Winnipeg with the immediately preceding and in part coexisting epidemic of poliomyelitis. The North Dakota epidemic arose almost simultaneously in diverse parts of the State, and this remote unconnected breaking out hardly suggested human contact as the sole means of spread.

The most striking epidemiological characteristic, which obtained in every section of the true epidemic area and at every period, was the unusual sex-age distribution. In North Dakota this was as follows:

Age	Males	Females	Age	Males	Females
Under 1	27	23	45–64	176	77
1–14	82	64	65 and over	96	43
15–24	125	29	Unknown	23	12
25–44	170	51			

The male predominance in children is of a degree common in infectious diseases, but the tremendous predominance among males in the working ages is out of all proportion to sex selectivity in any other infectious disease and can be accounted for only by differences in exposure.

Since the mosquitoes potentially incriminated are of the field varieties and since in this area the male population of working age has a greater exposure in the wheat fields than the female population, it did not seem right to withhold a warning against mosquitoes. The mosquito vector, if such existed, was of course effective in other

places as well as in the fields, and in fact there was evidence in four or five cases of placental transmission, as well as a much higher juvenile and infantile incidence than with the St. Louis type.

It is evident that if mosquitoes are responsible for transmission, there is likely to be a reservoir or reservoirs other than man or horses. The accompanying finding by Cox, Jellison, and Hughes points to one possible solution here. The prairie chicken incriminated is a bird of the grain fields especially, and it is noteworthy that the virus was found with uniform success in all animals inoculated in the spleen as well as in the central nervous system, thus indicating blood carriage and blood infectiousness.

ISOLATION OF WESTERN EQUINE ENCEPHALOMYELITIS VIRUS FROM A NATURALLY INFECTED PRAIRIE CHICKEN [1]

By Herald R. Cox, *Principal Bacteriologist*, William L. Jellison, *Associate Parasitologist*, and Lyndahl E. Hughes, *Assistant Scientific Aide, United States Public Health Service*

In the accompanying note,[2] an epidemic of encephalitis is briefly described centering in North Dakota and involving States and Provinces east, north, and south of that State. Laboratory studies carried out in isolating the causative agent from human and horse brains post mortem, as well as protection tests run with convalescent serums indicate that the western strain of equine encephalomyelitis virus was chiefly involved. Up to the present time western equine encephalomyelitis virus has been isolated from the brain tissues of 8 human cases, 3 horses, 1 prairie chicken, and 1 deer. We have also isolated 2 additional human strains which are apparently the western equine type and are now in process of being identified. A complete report of these studies will be made at a later date.

In connection with the laboratory work, field studies were carried out to determine, if possible, the extent of the virus infection in nature and its mode of spread. Specimens collected in the field were sent to the Rocky Mountain Laboratory for study.

The main object of this preliminary note is to report the isolation of western equine encephalomyelitis virus by Cox and Hughes from both brain and spleen of a prairie chicken (*Tympanuchus cupido americanus* (Reichenbach)),[3] also called pinnated grouse or prairie hen, shot in the field by Laboratory Assistant W. Truman Smith. This bird was shot about 8 miles south of Rugby, North Dakota, on August 27, 1941, while human epidemic cases were occurring in the vicinity.

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

[2] See p 1902.

[3] Roberts, Thos. S.· Birds of Minnesota. 2d ed., vol. 1, University of Minnesota Press, 1936.

It appeared to be ill before it was flushed, but it was able to fly and was shot in the air. Upon autopsy in the field the bird was found to have active maggot infestation in a breast wound, but the stage of development of the maggots indicated that this could not have occurred more than about 48 hours previously.

The brain and spleen were removed, placed in separate vials containing sterile, buffered, 50 percent glycerine solution of pH 7.5, and shipped to the laboratory in an iced packer by railway express. The specimens were received on August 29.

The brain and spleen were each separately tested by combined intracerebral and subcutaneous inoculation of 3 guinea pigs and 6 Swiss white mice. All inoculated animals developed symptoms typical of equine encephalomyelitis. The infection was readily transferred to passage animals by means of Seitz filtrates of brain tissue suspensions. The identity of the virus was determined by serum-virus protection tests carried out in guinea pigs by the standard intracerebral technique with known type-specific antiserums.

It is important to note that at the time this bird was killed a great number of human cases of encephalitis were occurring in the immediate area. In fact, the Rugby vicinity was one of the chief foci of the epidemic. One of the human strains reported here was isolated from a brain received from Rugby.

In 1938, Tyzzer, Sellards, and Bennett [4] isolated the eastern strain of equine encephalomyelitis virus from 2 wild pheasants and Fothergill and Dingle [5] isolated the same virus from a pigeon. It is believed that our finding the western strain of virus in a naturally infected prairie chicken constitutes the first time that this virus has been reported in a host other than man and horses, coincidental with a human epidemic in time and place.

EOSINATES OF THE AZURES AND METHYLENE BLUE IN PREPARATION OF A SATISFACTORY GIEMSA STAIN FROM DYES OF AMERICAN MANUFACTURE [1]

By M. A. Roe, *Surgeon*, A. Wilcox, *Assistant Technologist*, and R. D. Lillie, *Senior Surgeon, United States Public Health Service*

It has been shown (*1*) that Giemsa stains consisting of mixtures of the basic thiazin dyes and eosin can be successfully prepared with dyes of American manufacture. In compounding the required formulae by dissolving the dye mixtures in glycerine methyl alcohol, the

[1] From the Divisions of Infectious Diseases and Pathology, National Institute of Health

[4] Tyzzer, E. E., Sellards, A. W., and Bennett, B. L.: The occurrence in nature of "equine encephalomyelitis" in the ring-necked pheasant. Science, 88: 505–506 (1938).

[5] Fothergill, L. D., and Dingle, J. H.: A fatal disease of pigeons caused by the virus of the eastern variety of equine encephalomyelitis. Science, 88: 549–550 (1939).

wide variation in dye content encountered in different lots of azure B purchased on the market made it difficult to determine the correct quantity of this dye necessary to achieve the proper balance and to obtain uniform results in staining. Since the eosinates of azure B, azure A, and methylene blue are quite easily prepared in pure form and are apparently each of quite constant composition, a formula employing them instead of the dyes themselves was devised, thus eliminating the difficulties referred to.

Eosinates of the basic dyes were prepared by dissolving 2 grams of each in 200 cc. of distilled water. A 10 percent solution of eosin Y (certified by the Commission of Standardization of Biological Stains) was added, 15 cc. at first and then in 1 cc. quantities until the resulting solution in thin layers was pale blue without any pink between the particles. The eosinate precipitate was filtered out on hard filter paper in a Buchner funnel with vacuum, and then dried.[2]

Stock solutions of each eosinate were made up by dissolving 0.6 gm. in 100 cc. glycerine methyl alcohol for 1 to 2 days and allowing the excess dye to settle out. Mixtures consisting of varying proportions of these solutions of the eosinates were made up in 5 cc. quantities. Slides of malarial blood were stained with 1.5 cc. of each mixture in 50 cc. of water buffered at pH 7.0. Mixtures of eosinates of azure A, azure B, and methylene blue in the proportions 0.75:2.25:2.0; 0.5:2.25:2.25; and 0.5:2.0:2.5, respectively, gave the best results. On the whole, the staining of the parasite cytoplasm was improved by the addition of 0.75 cc. 1:1,000 aqueous solution of methylene blue to the 50 cc. of diluted stain. It was repeatedly shown that satisfactory staining of malarial parasites, thick and thin films, could be obtained with mixtures of saturated solutions of the eosinates of azure A, azure B, and methylene blue in proportions ranging around a 1:5:4 ratio, respectively, with an excess of methylene blue added.

As the total quantity of mixed dye solution (1.5 cc.) required was greater than that customarily employed with commercial preparations, it was decided to determine whether a more concentrated stock solution could be prepared by mixing the dry eosinates. Whether the above 1:5:4 proportion of the saturated solutions can be directly carried over into proportions of dry dyes depends on the relative solubilities of these eosinates. It was determined by progressive serial dilutions in steps of 0.05 percent that the three eosinates were soluble about 0.3 percent in equal parts of glycerine and methyl alcohol. Hence it was evident that the 1:5:4 proportion determined from the saturated solutions could be transferred to the dry dyes.

[2] The dyes used in this study were azure A NAz-6, azure B NAC 9348, and NAb-1, methylene Blue E and A old, NA-13 and LA-7, eosin Y LE-11, and old Grübler (reassayed). The eosinates were equivalent regardless of the dye lots used Only NA-13 and LA-7 were used as chlorides in the final mixtures.

Next a mixture of 0.05 gm. azure A eosinate, 0.25 gm. azure B eosinate, and 0.20 gm. methylene blue eosinate was dissolved in 50 cc. glycerine and 50 cc. methyl alcohol. This was serially diluted by 0.05 percent steps, samples being taken of each dilution for staining trials.

After each removal and new addition an interval of 24 hours with several shakings was allowed.

It was found that both thin and thick malaria blood films could be stained by using 1 cc. of stain solution at 0.5 percent and 0.45 percent strength. However, at 0.4 percent and all weaker solutions, differentiation of chromatin and cytoplasm of malaria parasites became defective. As this 0.5 percent solution of the mixed eosinates showed definite improvement of staining with the addition of 0.75 to 1.25 cc. 1:1,000 methylene blue to 50 cc. of a 1:50 dilution, with an optimum at 1 cc., the corresponding quantity (0.1 gm.) of dry methylene blue was added to this formula. This gave a final formula which, for convenience, was labeled "M":

Amended formula for Giemsa stain

Azure A eosinate	50 mg.
Azure B eosinate	250 mg.
Methylene blue eosinate	200 mg.
Methylene blue chloride (88 percent)	100 mg.[3]
Glycerine	50 cc.
Methyl alcohol	50 cc.

For purposes of comparing the composition of this formula "M" with that of our previous formula "A," calculation was made for the amounts of pure dyes dissociated by ionization during the process of staining. On the basis of 659 mg. (see table) of pure dye being available in solution with formula "M," a direct comparison was made with the proportions of the same dyes as they occur for the same total of dye in formula "A."

Name of dye	Original "A" formula	"A" formula proportions same total as "M"	"M" formula converted to dyes
	Mg.	*Mg.*	*Mg.*
Azure B bromide	200	129	148
Azure A chloride	50	32	25
Methylene blue chloride	270	175	193
Na eosinate	500	323	293
Total	1,020	659	659

[3] Recent tests on several lots of stain put up according to this formula by dye manufacturers have shown that 100 mg. of methylene blue is considerably in excess of the amount required. It is suggested that an amount ranging from 50 mg. to 75 mg. will be found satisfactory.

The data of this table show that the eosinate formula, although independently developed, corresponds well with the proportions of pure dyes used in formula "A." Furthermore, from the standpoint of staining efficiency, the total amount of dye required by formula "M" is considerably less than that required by "A."

After the freshly made solution had stood 2 to 3 days, successful results were uniformly obtained by staining blood films with the eosinate stain 1:50 in distilled water buffered to pH 7.0 for 45 minutes. Thin film preparations of malaria parasites stain well in all species. Red cells stain greyish pink, parasite cytoplasm rather intense grey blue with bluish red chromatin granules. Schüffner dots of tertian malaria may be brought out prominently by staining 1.5:50. This increase in concentration is also necessary with the Grübler samples now on hand. Thick films in malaria demonstrate a clear, bluish background, showing pinkish in thin portions. Tertian parasites demonstrate the typical pink finely stippled border around the parasites. Young rings of estivo-autumnal parasites stain prominently. The general stain effect of parasites on thick films shows a well-preserved outline with grey blue cytoplasm and purple chromatin mass.

Thin films of *Trypanosoma equiperdum* show well-stained undulating membrane with kinetoplastic, nuclear, and cytoplasmic bodies stained in detail.

SUMMARY

A satisfactory blood parasite stain was worked out using eosinates of azure A, azure B, and methylene blue of American manufacture. Greater constancy of composition is indicated than when thiazin dyes are used in substance.

Acknowledgment is made to the staff of St. Elizabeths Hospital for quartan malaria material.

REFERENCE

(*1*) Roe, M. A., Lillie, R. D., and Wilcox, A.: American azures in the preparation of satisfactory Giemsa stains for malaria parasites. Pub. Health Rep., **55**: 1272–1278 (July 12, 1940).

TWENTY-FOUR-HOUR OUTPUT OF CERTAIN URINARY CONSTITUENTS IN PERSONS EXPOSED TO LEAD ARSENATE SPRAY RESIDUE [1]

By STEWART H. WEBSTER, *Biochemist, United States Public Health Service*

INTRODUCTION

In the investigation of 1,231 individuals living in an apple-growing section of the State of Washington (*1*) specimens of urine were collected for chemical analysis. While 24-hour specimens were considered desirable, certain practical limitations were encountered. The most important of these were possible contamination of specimens during collection, inconvenience to the subjects, the uncertainty as to whether the samples represented the entire 24-hour output, and the necessity for securing comparable samples from the various groups of individuals studied. For these reasons the general plan which was adopted was to secure the first morning specimen after arising. It was realized at the time, however, that information was needed concerning 24-hour samples for a portion of this group.

The purpose of this experiment was to determine the total daily volume of urine excreted by a considerable number of adult male orchardists and to analyze these specimens for lead, arsenic, and certain other constituents such as phosphate and calcium. Such information would permit the measurement of the total daily output for these constituents and thus lead to more precise meaning of the analytical values for single specimens.

A group of persons periodically examined during the lead arsenate spray residue study were given two or three 1,000-cc. bottles instead of the usual 250-cc. size for the collection of the urine.[2] These individuals were asked to save the entire urine output for 24 hours. Returns to the field laboratory were made by 69 individuals. Here the volume was measured and recorded and two 250-cc. portions were shipped to the National Institute of Health for analysis.

Comprising the 69 persons [3] were 56 adult orchardists, 3 teen-age orchardists, 8 intermediates, 1 consumer, and 1 man in the special consideration group. One woman, classed as an intermediate, was included in this study.

In general, the orchardists were those engaged in the usual activities of apple growing, the intermediates were largely former orchardists, and the consumers were those engaged in activities not involving apple growing, washing, or packing.

---

[1] From the Division of Industrial Hygiene, National Institute of Health.

[2] Before the bottles were issued, alcoholic thymol was added as a preservative for the urine, as previously described (*2*).

[3] At the time these specimens were collected, the classification of individuals had not been completed; hence, the composite nature of this group.

Sixty-six specimens were collected in March and April and 3 in January and February. Since little orchard activity involving heavy exposure to lead arsenate was going on during the period of collection of specimens, the chief exposure to lead arsenate resulted from ingestion of lead arsenate sprayed apples. Of the 69 individuals studied only 2 stated that they consumed no apples at any time of the year.

Analyses were carried out for lead by the dithizone method (*2*), arsenic by the Gutzeit method (*1*), phosphate by a modification of the Leconte uranium acetate method (*3*, *4*), and calcium by a titration method (*5*). Determinations of pH were made colorimetrically (*1*).

EXPERIMENTAL RESULTS

Urine volumes.—The total daily volume for the 56 adult male orchardists (see table 1) was found to average 1,479 cc. and that for the 13 other individuals averaged 1,570 cc., or 1,496 cc. for the entire group. Figure 1 shows these values plotted against the ages of the 69 individuals included in this study. From this diagram it can be seen that age trends are not of importance.

In work previously described (*6*, *7*), 108 specimens obtained from 16 individuals were calculated on the 24-hour basis and found to have an average volume of 1,308 cc. Since the specimens were collected in cold weather, with but few exceptions, and within a period of 3 to 4 months, it is not likely that this difference can be explained as due to the effect of temperature on water output. A probable explanation lies in the large variation between individuals (585–3,000 cc.) and also between identical individuals on different days (for example, 1,280–2,370 cc. and 855–1773 cc.).[4]

The frequency distribution of the 24-hour urine volumes for the total of 177 specimens having an average value of 1,386 cc. (very nearly 1.4 liters) is shown in figure 2.

Concentration and total daily output of constituents.—Table 1 summarizes the analytical findings for the 69 individuals and in figures 3 and 4 are plotted the analytical values for lead, phosphate, calcium, and arsenic concentrations and for pH against the 24-hour volume of urine. From these figures the range in magnitude of the various measurements can be seen.

Calculations for the daily output for urinary lead (as Pb), arsenic (as As), phosphate (as P_2O_5), and calcium (as Ca) have been made for each person. From these individual values calculations of the average total daily outputs for the various classes included in table 1 have been made using the average concentration value and the corresponding average 24-hour urine volume for each class.

The phosphate and calcium outputs appear to be within the normal range for all of the individuals in the groups. However, the urinary

[4] The variation in urine volumes has been discussed in detail elsewhere (7).

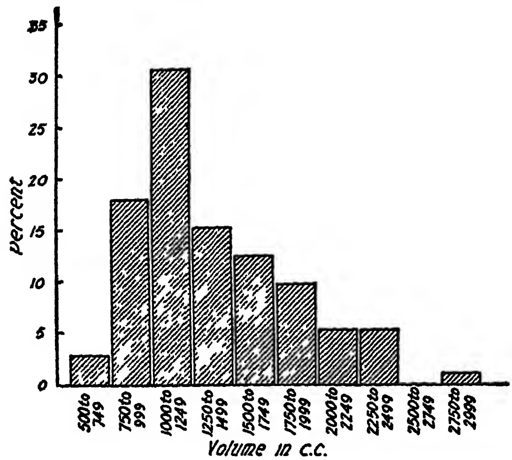


FIGURE 2.—Frequency distribution of 24-hour urine volumes of 177 specimens.

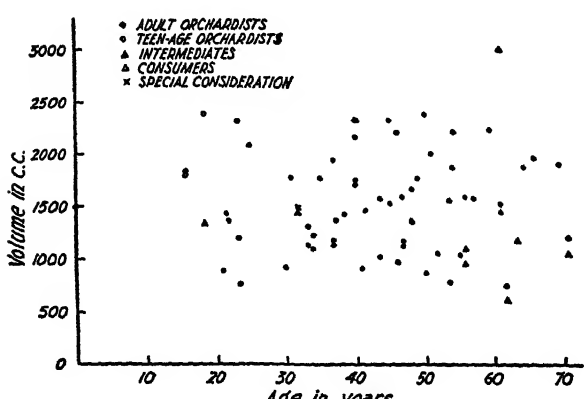


FIGURE 1.—24-hour urine volume for 69 individuals of various ages.

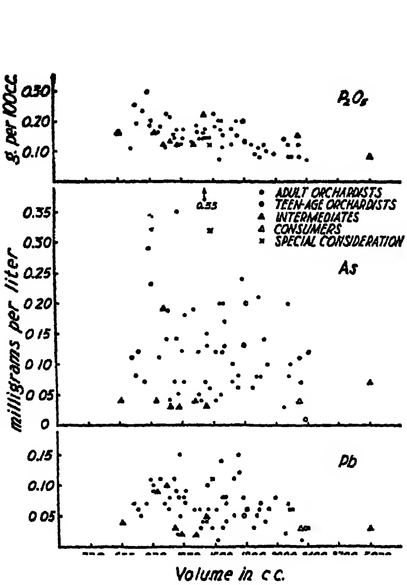


FIGURE 3.—Relationships between volume of 24-hour urine specimens and concentrations of various urinary constituents.

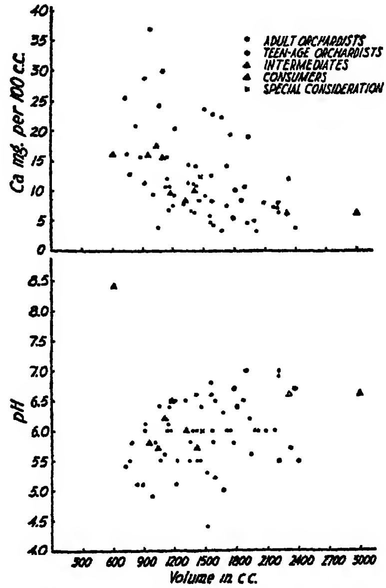


FIGURE 4.—(Upper) Relation between volume of 24-hour urine specimens and calcium concentration. (Lower) Relation between volume of 24-hour urine specimens and pH.

lead and urinary arsenic outputs of the orchardists can be seen to be definitely higher than those of the other groups.[5] The minimum and maximum values by classes is given in table 2 where the wide range in measurements will be noted.

TABLE 1.—*Summary of average lead, arsenic, and other values on 24-hour group*

Class	No. of persons	24-hour volume of urine (cc.)	24-hour urine specimens								Blood Pb, mg./100 g.
			Urinary Pb		Urinary As		Urinary P_2O_5		Urinary Ca		
			Mg./l.	Mg./24 hr.	Mg./l.	Mg./24 hr.	G./100 cc.	G./24 hr.	Mg./100 cc.	G./24 hr.	
Orchardists, men	56	1,479	0.070	0.104	0.128	0.189	0.15	2.22	12.3	0.182	0.041
Number of analyses	------	55	55	------	53	------	54	------	56	------	51
Orchardists, teen-age	3	1,995	.043	.086	.112	.223	.17	3.06	7.8	.141	.042
Number of analyses	------	3	3	------	3	------	2	------	2	------	3
Intermediates, adults	8	1,326	.048	.064	.058	.077	.14	1.86	12.6	.167	.022
Number of analyses	------	8	8	------	8	------	8	------	8	------	7
Consumers, men	1	2,320	.033	.077	.035	.081	.15	3.48	6.3	.146	.021
Number of analyses	------	1	1	------	1	------	1	------	1	------	1
Special consideration	1	1,480	.106	.157	.315	.466	.12	1.78	12.4	.184	.049
Number of analyses	------	1	1	------	1	------	1	------	1	------	1
Total number:											
Persons	69	------	------	------	------	------	------	------	------	------	------
Analyses	------	68	68	------	66	------	66	------	68	------	63
Average	------	1,496	.066	.094	.121	.176	.15	2.10	12.1	.165	.039

[5] One of the orchardists who spent most of his working time in mixing lead arsenate spray material wore a respirator. His exposure was therefore difficult to measure and for this reason he was placed in the special consideration group.

TABLE 2.—*Minimum and maximum 24-hour outputs of certain urinary constituents for various classes of individuals*

Class	Pb, mg per 24 hours		As, mg. per 24 hours		P_2O_5, g. per 24 hours		Ca, g. per 24 hours	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Orchardists, adult	0.009	0.254	0.039	0.743	1.10	3.46	0.040	0.376
Orchardists, teen-age	.060	.107	.024	.363	2.36	3.58	.095	.185
Intermediates	.023	.105	.021	.210	.97	.312	.099	.189
Consumer[1]	0.077		0.081		3.48		0.146	
Special consideration[1]	.159		.466		1.78		.184	

[1] 1 individual in this class.

Inspection of the graphs in figures 3 and 4 reveals trends in all these comparisons. The tendency for the high concentrations of the metallic constituent to be associated with low urinary volumes can be seen. This is especially noteworthy for phosphorus and calcium and may be due both to a dilution effect as well as to the rather narrow range of concentration values. As shown in table 3, which gives the minimum and maximum values for volumes and certain urinary constituents for the 69 individuals, the ratios for lead and arsenic are much larger than for the other measurements.

TABLE 3.—*Minimum and maximum values for volumes and certain urinary constituents for 69 individuals*

Kind of measurement	Unit of measurement	Minimum value	Maximum value	Ratio of maximum to minimum
Volume	Cc. per 24 hours	605	3,000	5.0
Lead (as Pb)	Mg. per liter	0.006	0.154	25.7
	Mg. per 24 hours	.009	.254	28.2
Arsenic (as As)	Mg. per liter	.010	.525	52.5
	Mg. per 24 hours	.021	.743	35.4
Phosphate (as P_2O_5)	G. per 100 cc.	.07	.29	4.1
	G. per 24 hours	.97	3.58	3.7
Calcium (as Ca)	Mg. per 100 cc.	3.3	37.0	11.2
	G. per 24 hours	.040	.376	9.4

Finally, larger volumes tend to be associated with less acid urines (those with higher pH). That this is not due merely to a dilution effect can be shown by the essentially constant pH values obtained on diluting urines with an equal volume of distilled water (*8*).

Significance of individual analyses.—The necessity for caution in drawing conclusions from analyses of single fractional-day specimens is well illustrated by two cases having a wide variation in urine volumes. Table 4 brings together the two sets of measurements.

TABLE 4

Case No.	24-hour urine volume (cc)	Urinary lead	
		Mg per liter	Mg per 24 hours
A	605	0 038	0 023
B	3,000	.031	.093

It is evident that without information concerning the total 24-hour volumes of urine little can be known about the lead outputs in the two cases. The assumption that identical concentrations signify approximately equal outputs is clearly unwarranted.

It has been shown elsewhere (*7*) that by taking the first morning specimen the effect of diurnal variation on the lead concentration is minimized. On the average, therefore, urinary lead concentration values for first morning specimens were found to approximate the concentration values for corresponding 24-hour samples. (See tables 5 and 6.) Or, stated less technically, the first morning specimen usually gave a concentration value not much different from the average concentration value for the entire 24-hour period.

The total daily output of a urinary constituent can be obtained by multiplying the average 24-hour concentration of that constituent by the 24-hour volume of urine. If the value 1.4 liters, found in this study, is taken as an average figure and the concentration value of the first morning specimen is used, it is then possible to estimate the daily output.

Care has been taken to recognize the limitation of such computations. It is not possible to apply them with any certainty to individual analyses owing to wide normal variations in concentration and urine volumes. Also it is not known whether the factor 1.4 holds for all seasons of the year or whether it can be applied to different occupational groups. Since the daily urine volumes for young children are less than those for adults (*9, 10*) this factor would not be expected to be constant for all age groups.

With these limitations in mind, calculations of the 24-hour lead outputs were made for the 69 individuals included in this study, using the factor 1.4 to convert milligram per liter to milligram per 24 hours. This was done for each person and class of persons. The results of such computations for each class are shown in table 5.

TABLE 5.—*Comparison of measured and estimated 24-hour urinary lead outputs for 69 individuals by classes*

Class	Number of persons	Measured mean values: 24-hour volume of urine (cc.)	Measured mean values: Urinary lead (mg. per 24 hours)	Estimated mean values: Urinary lead (mg. per 24 hours)	Average deviation from mean (mg.)
Orchardists, adult	56	1.479	0.104	0.098	0.023
Orchardists, teen-age	3	1,995	.086	.061	.022
Intermediates	8	1,326	.064	.067	.022
Consumer	1	2,320	.077	.046	.031
Special consideration group	1	1,480	.157	.148	.009
Average of 68 analyses		1,496	.094	.092	.023

In column 3 are given the mean values for the actual (measured) 24-hour urinary lead output for each of the groups. In column 4 are similar values calculated for a uniform volume of 1.4 liters per day. In the last column are given the averages of the individual deviations of the estimated and actual outputs. The largest and smallest deviations were 0.158 and 0.000 mg., respectively, the average of 68 being 0.023 mg.

These calculations suggest that for sufficiently large groups the individual deviation between the estimated and the measured output will usually be small and will average about a few hundredths of a milligram of lead.

To test this hypothesis there was needed a group of individuals for whom both morning and 24-hour specimens were available. In the diurnal variation study (7) samples were collected in such a way that calculations of this kind could be made for the four nonexposed and three exposed persons studied over a period of several days.

Tables 6 and 7 bring together the data for these two groups of individuals. Inspection of columns 1 and 2 will show the differences between the concentrations of the morning and the 24-hour specimens. The latter value was obtained in each case by dividing the total daily lead output by the corresponding daily urine volume. The total daily lead output, of course, was the sum of the lead in all samples collected during the 24-hour period. In column 5 is given the estimated daily output obtained by multiplying the concentration of the morning specimen by the assumed average volume of 1.4 liters. The last column indicates the differences between the measured and the estimated values.

TABLE 6.—*Comparison of measured and estimated 24-hour outputs of urinary lead for 3 nonexposed persons*

No.	Day	Pb concentration in mg. per liter		24-hour volume of urine (cc.)	Pb output in mg. per 24 hours		Difference, in mg.
		First morning specimen	24-hour specimen		Measured	Estimated	
1A	First	0.022	0.027	945	0.026	0.031	0.005
	Second	.025	.031	835	.026	.035	.009
	Third	.018	.024	1,090	.026	.025	.001
1B	First	.010	.023	905	.020	.014	.006
	Second	.029	.017	1,320	.023	.041	.018
	Third	.020	.023	875	.020	.028	.008
	Fourth	.015	.014	1,235	.017	.021	.004
2	First	.037	.030	2,020	.060	.052	.008
	Second	.030	.023	2,751	.064	.042	.022
	Third	.035	.027	1,807	.048	.049	.001
3	First	.036	.038	855	.032	.050	.018
	Second	.029	.018	1,773	.032	.041	.009
	Third	.029	.021	1,507	.032	.041	.009
Total		.335	.316	17,918	.426	.470	.118
Average		.026	.024	1,378	.033	.036	.009

TABLE 7.—*Comparison of measured and estimated 24-hour outputs of urinary lead for 3 exposed persons*

No.	Day	Pb concentration in mg. per liter		24-hour volume of urine (cc.)	Pb output in mg. per 24 hours		Difference, in mg.
		First morning specimen	24-hour specimen		Measured	Estimated	
1	First	0.081	0.089	993	0.088	0.113	0.025
	Second	.084	.085	955	.081	.118	.037
	Third	.084	.087	896	.078	.118	.040
2	First	.101	.067	1,618	.108	.141	.033
	Second	.045	.067	1,697	.113	.063	.050
	Third	.053	.066	1,510	.100	.074	.026
3	First	.044	.053	2,191	.117	.062	.055
	Second	.043	.062	1,785	.110	.060	.050
	Third	.067	.087	1,400	.122	.094	.028
Total		.602	.663	13,045	.917	.843	.344
Average		.067	.074	1,449	.102	.094	.038

These calculations have revealed three important facts: First, for groups of individuals the difference between the *average* 24-hour urinary lead output measured on 24-hour samples does not differ greatly from the *average* estimated output using first morning specimens and assuming a uniform volume of 1.4 liters per day. Second, smaller differences are expected when smaller quantities of lead are involved. Third, single analyses of fractional-day samples cannot be depended on to yield reliable information about individual outputs.

410621°—41-

The same considerations hold for arsenic as for lead although, owing to the rapid elimination of arsenic from the blood stream (*6*), the urinary arsenic values appear to fluctuate considerably more than the corresponding lead values.

SUMMARY AND CONCLUSIONS

The average 24-hour urine volume for 69 adults was found to be almost 1,500 cc. or 1.5 liters. An additional 108 specimens from another group of 16 adults gave an average value of very nearly 1.3 liters. The average for the 177 specimens was very nearly 1.4 liters per 24 hours. Large variations in these values were found to occur both between individuals and in identical individuals during different days.

Analyses of urine specimens for lead, arsenic, phosphate, and calcium content enabled concentration and total output values to be determined. It was found that the daily calcium and phosphate outputs for all the individuals studied were within the normal range. The lead and arsenic outputs were higher for the orchardists than for the other groups studied.

It was shown that comparison of urinary lead concentration values for different individuals when derived from fractional-day samples gave little information regarding relative daily outputs. It was also indicated that values obtained with 24-hour specimens gave more complete information regarding individual daily outputs.

The procedure of estimating the average daily output for a group of individuals from the average concentration of the first morning specimen and the average figure of 1.4 liters for the daily urine volume has been given. This method has been applied to two small groups of persons differing in geographical location, occupation, and exposure to lead arsenate and satisfactory agreement between the measured and estimated total 24-hour urinary lead outputs was found.

Where it is impossible or impracticable to obtain 24-hour specimens and where the chief interest is in group rather than individual values, first morning specimens are suggested as a satisfactory substitute.

ACKNOWLEDGMENTS

Passed Assistant Surgeon Harold T. Castberg secured and prepared the urine specimens for shipment and drew the graphs, Assistant Chemist William F. Knop helped with the lead analyses, Assistant Scientific Aide Stuart W. Jones assisted with the arsenic analyses, and Junior Chemist Frances L. Hyslop assisted with lead and other determinations. The author is also indebted to Principal Industrial Toxicologist Lawrence T. Fairhall and Passed Assistant Surgeon Waldemar C. Dreessen for their advice and consultation. It is a

pleasure to acknowledge the help and suggestions of these persons and especially those donors whose specimens were essential for this research.

REFERENCES

(1) Neal, P. A., Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Webster, S. H., Castberg, H. T., and Fairhall, L. T.: A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bull. 267, Government Printing Office, 1941.
(2) Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Page, R. T., Webster, S. H., Armstrong, D. W., and Sayers, R. R.: The control of the lead hazard in the storage battery industry. Public Health Bull. 262, Government Printing Office, 1941.
(3) Leconte, Ch.: Recherches sur l'analyse qualitative et quantitative de l'acide phosphorique. Comp. Rend., **29**: (No. 2) 55–56 (1849).
(4) Hawk, P. B., and Bergeim, O.: Practical Physiological Chemistry. 10th ed. Blakiston, 1931. Page 876.
(5) Bray, W. E.: Synopsis of Clinical Laboratory Methods. Mosby, 1936. Page 51.
(6) Webster, S. H.: Lead and arsenic ingestion and excretion in man. Pub. Health Rep., **56**: 1359–1368 (1941). Reprint No. 2290.
(7) Webster, S. H.: Diurnal variation of urinary lead excretion. Pub. Health Rep., **56**: 1834 (1941).
(8) Pratt, O. B., and Swartout, H. O.: pH values in routine urinalysis. J. Lab. and Clin. Med., **16**: 471–475 (1930–31).
(9) Neuberg, C.: Der Harn sowie die übrigen Ausscheidungen und Körperflüssigkeiten. Springer, Berlin, 1911. Part 1, p. 19.
(10) Holt, L. E., and McIntosh, R.: Holt's Diseases of Infancy and Childhood. Appleton-Century, 1936. Page 639.

DEVELOPMENT OF A LEPROUS PROCESS IN RATS AT THE SITE OF INOCULATION WITH MATERIAL FROM HUMAN LEPROSY[1]

By G. L. FITE, *Senior Pathologist, United States Public Health Service*

Jordan (*1*) reported the occurrence of a disease identical with rat leprosy which developed in two old rats at the site of inoculation with human leprosy. The experiment was open to the criticism that the animals had been kept in rooms in which rats infected with rat leprosy were also quartered. Subcutaneous transfers to other rats resulted in the uniform propagation of rat leprosy in those animals.

EXPERIMENTAL

Twenty-four rats were inoculated subcutaneously with an emulsion of a human lepromatous nodule, prepared by grinding, treating with 4 percent sulfuric acid, and washing. Twelve animals were inoculated with a heavy suspension of the centrifuged sediment in physiologic salt solution, and 12 with a similar suspension in about 2 percent gastric mucin. During the subsequent 16 months, 11 of the animals died and were autopsied. The remainder were autopsied 17½ months after the inoculation. Of these animals 4 had lep-

[1] From the Division of Infectious Diseases, Leprosy Investigations, Honolulu, Hawaii.

rosy—1 animal had a leproma 1.5 × 2 cm. and nearly 1 cm. thick at the site of inoculation, which grossly was typically rat leprosy; 2 other animals had lesions about 1 cm. broad, but thinner; in the fourth, leprosy was discovered only on histological examination.

Emulsions of the large lepromatous nodule, and of one of the smaller nodules, were each inoculated subcutaneously into 6 rats, and lesions typical of rat leprosy developed in 10 of the 12 animals. The lesions in these first transfers progressed more slowly than those resulting from strains of rat leprosy in use in this laboratory, but a second transfer resulted in uniform takes in 12 rats. This experiment also was open to the criticism that rats with rat leprosy were caged nearby and fed by a common handler.

In repeating the experiment 30 rats, 5 weeks old, were inoculated with an emulsion of human leprous material suspended in physiologic salt solution; 60 with the leproma in mucin suspension; 15 in 2 percent agar; 25 in a 2 percent silica gel, pH 7.4; and 30 were inoculated with heat-killed organisms. Through the courtesy of Dr. H. H. Walker, the rats inoculated with the mucin suspension were transferred to another laboratory (Leahi Home) where rats with rat leprosy had never been used and where possibility of contamination was minimal.

The mortality in these rats from causes unrelated to the experimental infection was high. Because of cannibalism or decomposition, 16 rats were not autopsied.

Two animals developed a leprous process at the site of inoculation. Both of these animals were among the 18-month survivors kept at the Leahi laboratory. The lesions were small or early, not grossly characteristic but proven by microscopic examination, and appeared in animals inoculated with mucin suspensions. Although this figure is low compared to the total group, if the occurrence is restricted to the animals in the mucin group surviving 18 months, 2 out of 22 might be said to have developed rat leprosy.

The other findings are not without interest. The animals receiving silica gel all showed early calcification of the foci and these results, as well as those in the agar group, were apparently not distinguishable from the results in the group of animals inoculated with killed organisms. This suggests early death of the organisms in these groups.

HISTOLOGICAL CONSIDERATIONS

The lesions which develop in rats following inoculation with human leprosy have often been described. They appear to undergo a temporary period of activity with some possible growth of bacilli during the first 2 or 3 months, but afterwards regress with much scarring and frequent calcification of the central part of the lesion. The

central part often shows a capsule, yet there are collections of lymphocytes outside the encapsulated area, and groups of epithelioid cells characteristically are embedded in the accumulations of lymphocytes. In the early months these foci often contain abundant acid-fast bacilli, but the greatest numbers of bacilli occur in groups or masses, some intracellular, but many extracellular, along the inner margin of the capsule and amid the amorphous inspissated or calcified material and scar tissue. When the epithelioid cell foci contain abundant bacilli they appear not unlike similar foci of rat leprosy, but the examination of many animals (about 150 in addition to those enumerated above) shows that bacilli in these foci steadily diminish in number and most frequently disappear.

There are conflicting reports in the literature concerning the persistence of heat-killed human lepra bacilli inoculated into rats. In the present experiment 7 out of 26 rats survived a year or more with numerous bacilli in the lesions. Marginal epithelioid cell foci also occurred in this group, and these cells contained a few acid-fast bacilli at 18 months. Therefore no conclusions could be drawn from the histological appearance of a lesion as to the viable state of the organisms therein. Those inoculated with mucin suspensions gave a much larger proportion with abundant bacilli, only 6 out of 59 animals failing to show numerous organisms; more organisms occurred intracellularly at the margin of the lesions and in the satellite foci.

The lesions were histologically characteristic of rat leprosy, with spreading of abundant bacillus-laden cells. In two animals remnants of the nonspecific scarred lesion were still present in the center of the lesion, invaded by the active leprous process. In another animal the chronic lesion was intact, with typical extensions of the leprous process into the overlying skin.

DISCUSSION

The action of mucin in these experiments is obscure, yet it appears to have had some effect. Of the six animals that developed leprosy, five were inoculated with mucin suspensions of the human organism. The mucin produced a foreign body reaction with giant cells, in which acid-fast bacilli regularly occurred in moderate numbers. On the other hand, the animals inoculated with the agar suspension also showed a similar foreign body reaction, so that the difference does not appear to be attributable to this. Numerous substances have been added to the inoculum by Tisseuil (*2*)—olive oil, gelatin, glycerin, bile, and vaseline. Similar suspensions, in coconut oil and in digests, extracts, and filtrates of rat lepromas, have been made in this laboratory, all without results.

SUMMARY AND CONCLUSION

Six rats inoculated with human leprosy, out of a total of 154, developed a leprous process at the site of inoculation after a prolonged incubation period of 17½ to 18 months. In 2 of these cases the possibility of spontaneous infection was as nearly as possible excluded. The addition of mucin to the inoculum appeared to favor the survival and persistence of bacilli in the lesions as well as to favor the occurrence of the leprosy.

REFERENCES

(1) Jordan, P.: Übertragung der Lepra des Menschen auf Zuchtratten mit der Moglichkeit zum Weiterimpfen und auch als fortschreitende Krankheit Arch. Schiffs- u. Tropenhyg., **40:** 92 (1936).
(2) Tisseuil, J.: Essais d'inoculation de la lèpre humaine au rat d'élevage. Bull. Soc. Path Exot., **32:** 542 (1939) and **32:** 546 (1939). Trop. Dis. Bull, **36:** 1019 (1939).

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

August 10–September 6, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended September 6, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Poliomyelitis.—During the 4 weeks ended September 6, there were 2,370 cases of poliomyelitis reported as compared with 1,296 during the preceding 4 weeks and 2,376 for the same period in 1940. Of the total number of cases, Alabama reported 291, New York, 255, Georgia, 242, Ohio, 150, Tennessee, 143, New Jersey, 103, Illinois, 93, and Maryland, 85 cases; more than two-thirds of the cases occurred in these 8 States. It is apparent that the present outbreak has been confined mostly to the Atlantic Coast and East South Central regions as all of the States reporting an unusually high incidence, except Ohio and Illinois, are located in those regions. In the North Central, West South Central, Mountain, and Pacific regions the incidence is considerably below the average seasonal occurrence. Practically all of the States in the South Atlantic and East South Central regions reported a decline in the number of cases during the last week (ended September 6) of the current 4-week period, while States in the Middle Atlantic region continued to report an increase. For the country as

a whole the number of cases dropped from 624 during the week ended August 30, the highest weekly incidence so far reported, to 586 for the following week.

While the current incidence (2,370 cases) was approximately the same as that recorded for the corresponding period in 1940, it was more than 1.4 times the 1936–40 average incidence for this period. In the New England and Middle Atlantic regions the incidence was the highest since 1935, while in the South Atlantic and East South Central regions the incidence was the highest in the 13 years for which these data are available. In recent years the peak incidence for the season has generally been reached during the period corresponding to the current one, but since some States reported the highest incidence during the last week of the period it may not be safely assumed that the peak has yet been reached.

More cases of poliomyelitis have been reported in the United States since the beginning of the current year (4,643) than for the corresponding period since 1937, when 5,553 cases were reported. In 1938, a year in which there was no unusual outbreak of this disease, there were 1,164 cases reported for the first 36 weeks of the year.

Influenza.—For the 4 weeks ended September 6 there were 2,187 cases of influenza reported, as compared with 1,658, 1,492, and 1,561 cases for the corresponding period in 1940, 1939, and 1938, respectively. The relatively high incidence appeared to be largely due to an unusual prevalence of the disease in the West South Central region, the cases there being about four times the 1936–40 median incidence for this period. Minor excesses were reported from the South Atlantic, Mountain, and Pacific regions, while in other regions the incidence was either lower than the normal seasonal incidence or closely approximated it.

Measles.—While the number of cases of measles dropped from approximately 12,000 during the preceding 4-week period to 3,884 during the current period, the incidence was about 25 percent above the 1940 figure and almost 40 percent above the 1936–40 median incidence for the corresponding period. The excesses in the various geographic regions ranged from 10 percent in the East South Central region to more than three and one-half times the average seasonal incidence in the West South Central region.

Whooping cough.—The incidence of whooping cough was also relatively high. The number of cases reported during the current period (12,552) was more than 10 percent above the number of cases for the corresponding period in 1940, which figure (10,970) also represents the 1936–40 average incidence for the period. The greatest excesses were reported from the East North Central, Mountain, and Pacific regions. A very significant decline in the number of cases was reported from the Middle Atlantic region.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period August 10–September 6, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	964	770	1,446	2,387	1,658	1,492	3,884	3,149	2,819
New England	14	13	17	0	4	4	423	349	233
Middle Atlantic	68	60	128	14	31	29	809	954	684
East North Central	91	79	172	89	121	121	631	803	545
West North Central	80	94	94	51	35	53	184	118	139
South Atlantic	300	177	466	608	831	501	702	191	235
East South Central	187	119	235	70	67	67	130	202	118
West South Central	154	133	201	1,270	450	318	418	165	121
Mountain	38	52	52	192	79	79	207	151	151
Pacific	32	43	71	93	40	67	380	216	216
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	122	93	136	2,370	2,376	1,648	2,388	2,524	3,264
New England	7	2	7	110	25	25	213	106	142
Middle Atlantic	22	15	30	616	105	105	429	455	514
East North Central	19	16	18	336	1,009	484	551	766	1,002
West North Central	6	17	17	111	593	209	255	265	401
South Atlantic	33	12	23	526	236	111	322	290	303
East South Central	15	14	21	545	90	88	194	177	243
West South Central	8	11	13	42	96	55	113	126	171
Mountain	4	1	11	27	79	42	89	116	120
Pacific	8	5	6	57	143	143	222	223	288
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	19	36	141	1,356	1,655	2,295	12,552	10,970	[3] 10,970
New England	0	0	0	35	38	40	765	690	712
Middle Atlantic	0	0	0	168	148	265	2,228	2,704	3,176
East North Central	7	10	28	158	158	315	3,793	2,878	2,965
West North Central	6	13	27	72	58	169	885	536	536
South Atlantic	2	2	1	300	345	434	1,475	1,297	1,297
East South Central	2	1	1	256	247	318	483	452	442
West South Central	1	2	5	275	537	449	631	826	665
Mountain	0	6	24	40	51	89	979	362	406
Pacific	1	2	14	52	43	86	1,313	1,225	740

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The number of cases (964) of diphtheria was about 25 percent in excess of the number reported for the corresponding period in 1940, but it was less than 70 percent of the 1936–40 average incidence for this period. Considerable increases over last year were reported from the South Atlantic and South Central regions, but the incidence in each geographic region was well below the average seasonal incidence.

Meningococcus meningitis.—There were 122 cases of meningococcus meningitis reported for the 4 weeks ended September 6, as compared with 93, 99, and 136 for the corresponding period in 1940, 1939, and

1938, respectively. The highest incidence was reported from the South Atlantic region, the number of cases (33) being approximately 3 times the number reported in 1940 and about 35 percent in excess of the 1938–40 average incidence for the region.

Scarlet fever.—The incidence of scarlet fever was relatively low, the total of 2,388 cases being about 90 percent of the number reported during this period in 1940, and approximately 75 percent of the average incidence for the corresponding period in 1936–40. A few more cases than might normally be expected occurred in the New England and South Atlantic regions, but in all other regions the situation was quite favorable.

Smallpox.—Smallpox reached a new low level during the current period, the number of cases (19) being considerably below even the preceding year when 36 cases were reported for this period. In 1929 and 1930 the numbers of cases occurring during the period corresponding to the current one were 753 and 660, respectively, while in 1937 and 1938, more recent years in which smallpox has been very prevalent, the cases for this period totaled 222 and 147, respectively.

Typhoid fever.—The incidence of typhoid fever was considerably below the average; the reported cases numbered 1,356 as compared with 1,655 for the same period in 1940 and an average of 2,295 cases during the corresponding period in the years 1936–40. The situation was favorable in all sections of the country.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4-week period ended September 6, based on data received from the Bureau of the Census, was 9.9 per 1,000 inhabitants (annual basis). The average rate for this period in the years 1938–40 was 10.0 per 1,000.

DEATHS DURING WEEK ENDED SEPTEMBER 13, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Sept. 13, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,416	7,192
Average for 3 prior years	7,666	
Total deaths, first 37 weeks of year	313,367	313,925
Deaths per 1,000 population, first 37 weeks of year, annual rate	11.9	11.9
Deaths under 1 year of age	542	488
Average for 3 prior years	491	
Deaths under 1 year of age, first 37 weeks of year	19,399	18,484
Data from industrial insurance companies:		
Policies in force	64,458,633	64,881,635
Number of death claims	10,202	11,088
Death claims per 1,000 policies in force, annual rate	8.3	8.9
Death claims per 1,000 policies, first 37 weeks of year, annual rate	9.6	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED SEPTEMBER 20, 1941

Summary

The incidence of poliomyelitis for the country as a whole (596 cases) was practically the same as for last week (595 cases). Decreases in about half of the States were slightly more than compensated for by increases in other States. The largest numerical increases were reported in Alabama, Indiana, Pennsylvania, and Maryland.

The following listed 13 States reported 15 or more cases during the current week (last week's figures in parentheses): New York, 113 (109); Pennsylvania, 70 (63); Alabama, 57 (38); Ohio, 34 (35); New Jersey, 27 (41); Illinois, 25 (25); Minnesota, 24 (24); Maryland, 24 (17); Tennessee, 24 (29); Georgia, 22 (26); Massachusetts, 20 (16); Michigan, 20 (20); Indiana, 15 (7). Connecticut dropped out of this group during the current week, while Indiana was added.

To date (first 38 weeks), 5,800 cases of poliomyelitis have been reported for the country as a whole, as compared with 7,121 in 1937 and 5,652 in 1940, for the corresponding period.

North Dakota reported 37 cases of encephalitis, as compared with 27 last week. More than 2,100 cases have been reported during the present outbreak in the three States—North Dakota, Minnesota, and South Dakota. The disease in this area has been predominantly rural and has attacked males more frequently than females, with a ratio of 4 to 1 at ages 15–24. The western equine encephalomyelitis virus has been isolated from both brain and spleen of a prairie chicken in North Dakota.[1]

Only 4 cases of Rocky Mountain spotted fever were reported during the week—2 in Wyoming and 2 in Virginia.

Of 672 cases of influenza, 254 cases were reported in Texas, and of 110 cases of endemic typhus fever, 36 cases occurred in Texas, 30 in Georgia, and 17 in Alabama.

The crude death rate for the current week for 88 large cities in the United States was 10.1 per 1,000 population, as compared with 10.4 for the preceding week, and a 3-year (1938–40) average of 10.6 for the corresponding week.

[1] See pp. 1902 and 1905.

Telegraphic morbidity reports from State health officers for the week ended September 20, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Sept. 20, 1941	Sept. 21, 1940		Sept. 20, 1941	Sept. 21, 1940		Sept. 20 1941	Sept. 21, 1940		Sept. 20, 1941	Sept. 21, 1940	
NEW ENG.												
Maine	0	1	1	------	------	------	13	10	9	0	0	0
New Hampshire	1	0	0	------	------	------	0	0	1	0	0	0
Vermont	0	1	1	------	------	------	2	1	1	0	0	0
Massachusetts	4	3	4	------	------	------	20	39	17	3	2	1
Rhode Island	4	0	0	------	------	------	0	0	------	0	0	0
Connecticut	1	0	1	------	1	2	12	2	3	0	0	0
MID. ATL.												
New York	7	6	11	[1]2	2	[1]3	56	48	43	2	3	3
New Jersey	3	3	7	3	2	4	26	32	14	2	0	0
Pennsylvania	1	11	14	------	------	------	75	92	24	4	3	3
E. NO. CEN.												
Ohio	6	8	11	4	14	2	14	5	6	0	0	0
Indiana	3	15	15	12	18	12	3	11	3	1	1	1
Illinois	16	10	25	2	4	5	21	24	15	1	1	2
Michigan [2]	0	1	9	--	11	2	22	54	18	0	0	1
Wisconsin	0	0	2	86	23	23	34	56	27	0	2	2
W. NO. CEN.												
Minnesota	4	1	4	------	1	------	5	9	9	0	0	0
Iowa	0	2	2	2	------	------	3	34	3	0	1	0
Missouri	14	11	11	------	1	15	6	2	3	0	1	0
North Dakota	1	4	1	------	1	4	13	2	2	0	0	0
South Dakota	10	1	1	------	2	------	1	5	2	0	0	0
Nebraska	6	2	3	------	------	------	3	11	1	0	1	0
Kansas	1	7	6	------	1	1	6	4	4	1	0	1
SO. ATL.												
Delaware	0	0	0	1	------	------	2	2	2	0	0	0
Maryland [2,3]	2	4	4	1	1	2	13	5	5	2	1	1
Dist. of Col.	0	1	4	------	------	------	6	0	1	0	0	0
Virginia [3,4]	19	23	35	41	58	37	29	6	6	2	3	1
West Virginia [2]	4	9	10	------	6	6	11	1	2	2	0	2
North Carolina [3]	53	46	103	------	------	------	24	12	12	1	0	0
South Carolina [3]	43	7	27	80	97	135	14	1	1	3	1	1
Georgia [3]	35	9	30	11	4	4	21	3	0	0	0	0
Florida [3]	5	8	9	2	------	------	3	2	1	1	0	0
E. SO. CEN.												
Kentucky	14	9	19	------	2	2	16	4	4	0	0	2
Tennessee [2]	15	8	37	18	9	17	28	11	10	1	2	2
Alabama [4]	20	10	43	8	198	20	7	5	1	0	0	2
Mississippi [2,3]	15	13	17	------	------	------	------	------	------	2	1	1
W. SO. CEN.												
Arkansas	4	10	15	9	10	8	11	18	2	0	.0	0
Louisiana [3]	7	8	13	26	2	3	3	0	1	2	0	0
Oklahoma	10	10	10	10	21	17	2	4	1	0	1	1
Texas [2,3]	23	29	33	254	102	70	41	17	10	1	1	1
MOUNTAIN												
Montana	9	0	1	2	4	4	3	27	5	0	1	0
Idaho	0	0	0	------	------	------	1	5	2	0	0	0
Wyoming [4]	3	5	0	3	------	------	1	2	2	0	0	0
Colorado	6	1	7	23	6	------	10	6	6	0	0	0
New Mexico	0	8	2	------	------	------	5	1	4	1	0	0
Arizona	0	0	2	32	30	28	12	12	4	0	0	0
Utah [2]	0	1	1	4	3	2	2	2	2	0	0	0
Nevada	0	------	------	------	------	------	0	------	------	0	------	------
PACIFIC												
Washington	0	2	2	------	------	------	11	2	10	1	2	0
Oregon	1	10	2	12	9	6	18	6	6	0	0	0
California [3]	13	18	28	24	11	11	51	31	40	1	1	1
Total	383	336	553	672	654	471	680	626	626	34	29	32
38 weeks	9,133	10,043	16,195	603,197	171,545	153,627	534,679	231,800	271,869	1,575	1,291	2,317

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 20, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis: Week ended— Sept. 20, 1941	Poliomyelitis: Week ended— Sept. 21, 1940	Poliomyelitis: Median 1936–40	Scarlet fever: Week ended— Sept. 20, 1941	Scarlet fever: Week ended— Sept. 21, 1940	Scarlet fever: Median 1936–40	Smallpox: Week ended— Sept. 20, 1941	Smallpox: Week ended— Sept. 21, 1940	Smallpox: Median 1936–40	Typhoid and paratyphoid fever: Week ended— Sept. 20, 1941	Typhoid and paratyphoid fever: Week ended— Sept. 21, 1940	Typhoid and paratyphoid fever: Median 1936–40
NEW ENG.												
Maine	0	0	0	6	2	2	0	0	0	0	0	1
New Hampshire	3	0	0	0	3	3	0	0	0	0	3	0
Vermont	1	2	2	3	4	2	0	0	0	0	0	0
Massachusetts	20	1	1	51	35	40	0	0	0	1	2	2
Rhode Island	3	0	0	3	1	1	0	0	0	1	1	0
Connecticut	10	0	0	19	8	11	0	0	0	1	1	2
MID. ATL.												
New York	113	18	18	65	102	86	0	0	0	18	22	20
New Jersey	27	5	5	19	26	26	0	0	0	6	2	11
Pennsylvania	70	11	11	42	87	106	0	0	0	17	20	20
E. NO. CEN.												
Ohio	34	52	17	64	79	89	0	0	0	6	18	18
Indiana	15	49	3	22	35	36	0	0	0	4	8	8
Illinois	25	62	48	73	127	109	0	1	1	9	16	22
Michigan [2]	20	115	53	76	100	100	0	0	1	10	8	11
Wisconsin	1	27	6	48	38	60	0	0	0	1	1	3
W. NO. CEN.												
Minnesota	24	16	16	25	32	32	1	4	3	2	5	4
Iowa	2	121	5	17	34	28	1	0	1	6	2	3
Missouri	5	32	4	18	27	27	1	0	0	9	13	14
North Dakota	0	5	1	4	6	6	0	1	1	1	0	1
South Dakota	0	9	2	9	8	8	0	0	0	0	0	0
Nebraska	1	24	0	3	12	6	0	0	0	1	3	1
Kansas	5	53	3	48	35	35	0	0	0	7	11	7
SO. ATL.												
Delaware	1	0	0	7	4	1	0	0	0	0	4	1
Maryland [2 3]	24	0	2	11	16	17	0	0	0	11	6	6
Dist. of Col.	2	0	2	5	3	7	0	0	0	0	4	0
Virginia [3 4]	4	22	4	20	11	20	0	0	0	7	11	22
West Virginia [3]	1	66	3	9	17	34	0	0	0	12	11	12
North Carolina [3]	8	7	1	42	64	58	0	0	0	10	15	15
South Carolina [3]	11	0	0	1	2	9	0	0	0	6	14	14
Georgia [3]	22	0	1	23	19	22	1	0	0	16	18	15
Florida [3]	6	0	1	2	3	3	0	0	0	1	4	4
E. SO. CEN.												
Kentucky	7	16	5	19	19	33	0	1	0	15	18	28
Tennessee [3]	24	3	1	44	52	36	0	0	0	15	25	21
Alabama [3]	57	1	1	13	32	18	0	0	0	8	20	13
Mississippi [2 3]	5	3	3	3	10	10	0	0	0	12	9	6
W. SO. CEN.												
Arkansas	2	0	1	2	6	9	2	0	0	16	14	15
Louisiana [3]	2	8	2	2	4	6	0	0	0	25	23	17
Oklahoma	3	8	2	5	9	9	0	0	0	3	11	15
Texas [2 3]	3	1	5	33	19	23	0	1	0	36	46	45
MOUNTAIN												
Montana	0	5	2	8	17	13	0	0	5	1	0	2
Idaho	0	6	1	1	8	8	0	0	0	3	8	1
Wyoming [4]	0	5	2	3	2	1	0	1	0	0	1	1
Colorado	4	3	6	20	11	12	0	0	2	4	7	7
New Mexico	0	1	1	4	1	2	0	0	0	1	5	14
Arizona	2	0	0	3	2	2	0	0	0	1	2	2
Utah [3]	2	2	2	2	0	3	0	0	0	1	0	1
Nevada	0			0			0			0		
PACIFIC												
Washington	5	20	6	8	15	13	0	0	2	3	1	6
Oregon	12	8	3	6	5	7	0	0	0	0	1	3
California [3]	10	9	15	42	66	67	0	0	2	14	8	13
Total	596	796	484	953	1,218	1,241	6	9	42	321	422	451
38 weeks	5,800	5,652	4,430	95,531	122,906	142,286	1,213	2,011	8,233	6,157	7,058	9,868

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 20, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Sept. 20, 1941	Whooping cough, Week ended— Sept. 21, 1940	Division and State	Whooping cough, Week ended— Sept. 20, 1941	Whooping cough, Week ended— Sept. 21, 1940
NEW ENG.			SO. ATL.—continued		
Maine	10	12	Georgia [3]	35	10
New Hampshire	3	0	Florida [3]	13	2
Vermont	3	0	E. SO. CEN.		
Massachusetts	123	150	Kentucky	88	58
Rhode Island	42	4	Tennessee [3]	33	16
Connecticut	34	47	Alabama [3]	13	7
MID. ATL.			Mississippi [2 3]		
New York	370	237	W. SO. CEN.		
New Jersey	153	90	Arkansas	10	21
Pennsylvania	214	330	Louisiana [3]	1	5
E. NO. CEN.			Oklahoma	5	3
Ohio	279	243	Texas [2 3]	84	144
Indiana	10	25	MOUNTAIN		
Illinois	197	116	Montana	12	7
Michigan [2]	263	329	Idaho	0	6
Wisconsin	222	82	Wyoming [4]	27	7
W. NO. CEN.			Colorado	83	6
Minnesota	90	37	New Mexico	21	22
Iowa	21	42	Arizona	13	8
Missouri	12	34	Utah [2]	27	36
North Dakota	10	3	Nevada	3	
South Dakota	50	2	PACIFIC		
Nebraska	21	8	Washington	51	34
Kansas	58	39	Oregon	33	6
SO. ATL.			California [3]	240	257
Delaware	0	8	Total	3,274	2,722
Maryland [2 3]	69	80	38 weeks	162,777	120,292
Dist. of Col.	13	7			
Virginia [3 4]	27	34			
West Virginia [2]	31	36			
North Carolina [3]	97	60			
South Carolina [3]	60	12			

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended September 20, 1941, 110 cases, as follows: Maryland, 1; Virginia, 1; North Carolina, 1; South Carolina, 8; Georgia, 30; Florida, 5; Tennessee, 1; Alabama, 17; Mississippi, 4; Louisiana, 5; Texas, 36; California, 1.
[4] Rocky Mountain spotted fever, week ended September 20, 1941, 4 cases, as follows: Virginia, 2; Wyoming, 2.

WEEKLY REPORTS FROM CITIES

City reports for week ended September 6, 1941

This table lists the reports from 133 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Maine:											
Portland	0	------	0	0	3	2	0	0	0	5	29
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	0	10
Manchester	0	------	0	0	0	4	0	0	0	0	5
Nashua	0	------	0	0	0	0	0	0	0	0	6
Vermont:											
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	1	0	0	2
Massachusetts:											
Boston	0	------	1	3	5	16	0	4	1	18	185
Fall River	1	------	0	1	1	1	0	0	0	4	21
Springfield	0	------	0	0	0	5	0	0	0	5	35
Worcester	0	------	0	0	4	1	0	0	0	2	36
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	16
Providence	0	------	0	1	1	0	0	1	1	23	60
Connecticut:											
Bridgeport	0	1	1	7	1	1	0	0	0	0	32
Hartford	0	------	0	0	0	0	0	0	0	1	45
New Haven	0	------	0	0	0	1	0	0	0	7	47
New York:											
Buffalo	0	------	0	1	5	10	0	1	0	6	103
New York	4	1	0	14	45	27	0	57	15	160	1,285
Rochester	0	------	0	5	4	0	0	0	0	4	52
Syracuse	1	------	0	0	0	2	0	2	0	31	33
New Jersey:											
Camden	0	------	0	0	0	1	0	0	1	1	27
Newark	0	3	0	6	3	6	0	4	0	25	85
Trenton	0	------	0	0	1	1	0	2	0	0	33
Pennsylvania:											
Philadelphia	2	------	1	1	17	14	0	12	3	39	391
Pittsburgh	3	------	1	3	9	2	0	7	1	36	157
Reading	0	------	0	1	0	0	0	0	0	3	14
Scranton	0	------	--------	0	-------	0	0	-------	0	1	--------
Ohio:											
Cincinnati	0	------	0	2	0	2	0	5	0	11	131
Cleveland	1	4	0	2	3	4	0	4	0	56	186
Columbus	1	------	0	0	0	1	0	2	0	10	70
Toledo	0	------	0	2	1	2	0	5	0	20	71
Indiana:											
Anderson	0	------	0	0	0	0	0	0	1	0	14
Fort Wayne	0	------	0	0	1	1	0	0	1	0	18
Indianapolis	1	------	0	1	6	0	0	4	0	0	98
Muncie	0	------	0	0	1	0	0	0	0	5	6
South Bend	0	------	0	1	0	1	0	0	0	0	29
Terre Haute	0	------	0	0	0	0	0	0	0	0	15
Illinois:											
Chicago	12	------	0	4	7	9	0	26	1	119	597
Elgin	0	------	0	0	0	0	0	0	0	6	6
Moline	0	------	0	0	0	0	0	0	0	1	10
Springfield	0	------	0	6	1	4	0	0	1	2	11
Michigan:											
Detroit	1	------	0	9	7	10	0	7	3	98	281
Flint	0	------	0	0	1	1	0	1	0	9	23
Grand Rapids	0	------	0	1	0	0	0	0	0	13	29
Wisconsin:											
Kenosha	0	------	0	0	0	2	0	0	0	0	7
Madison	0	------	0	4	0	0	0	0	0	3	16
Milwaukee	0	------	0	4	0	10	0	3	0	128	81
Racine	0	------	0	1	0	1	0	1	0	9	10
Superior	0	------	0	0	0	1	0	0	0	3	7
Minnesota:											
Duluth	0	------	0	0	1	0	0	0	0	24	24
Minneapolis	0	------	0	0	1	2	0	0	0	13	99
St. Paul	0	------	0	1	2	7	0	1	0	15	50

City reports for week ended September 6, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0			0		2	0		0	0	
Davenport	1			0		3	0		0	1	
Des Moines	0			0		3	0		0	6	22
Sioux City	0			0		0	0		0	2	
Waterloo	0			0		1	0		0	3	
Missouri:											
Kansas City	0		0	0	3	1	0	0	0	3	86
St. Joseph	1		2	0	2	0	0	1	0	0	28
St. Louis	0		0	3	8	5	0	1	3	8	209
North Dakota:											
Fargo	0		0	0	1	0	0	1	0	6	8
Grand Forks	0			0		0	0		0	0	
Minot	0		0	1	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	1			0		1	0		0	6	
Sioux Falls	0			0		0	0		0	0	6
Nebraska:											
Lincoln	0			1		0	0		0	0	
Omaha	0		0	0	1	0	0	0	0	2	45
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	2	0
Topeka	0		0	0	2	1	0	0	0	10	22
Wichita	0		0	2	2	2	0	0	0	7	21
Delaware:											
Wilmington	0		0	0	1	1	0	1	0	0	23
Maryland:											
Baltimore	0	1	1	15	6	7	0	10	0	42	200
Cumberland	0		0	0	0	0	0	0	0	0	9
Frederick	0		0	0	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	1		0	6	3	3	0	10	1	19	169
Virginia:											
Lynchburg	0		0	1	0	0	0	0	0	0	10
Norfolk	0		0	0	0	0	0	0	1	1	21
Richmond	0		0	3	0	0	0	2	0	0	44
Roanoke	0		0	0	0	0	0	0	0	0	17
West Virginia:											
Charleston	0		0	0	0	0	0	0	0	0	19
Huntington	0			0		0	0		0	0	
Wheeling	0		0	1	1	0	0	1	0	0	27
North Carolina:											
Gastonia	0			0		0	0		0	2	
Raleigh	0		0	0	1	0	0	2	0	6	10
Wilmington	0		0	7	2	1	0	0	0	8	7
Winston-Salem	0		0	1	1	0	0	1	1	0	12
South Carolina:											
Charleston	0	3	0	0	2	0	0	0	2	2	10
Florence	0			0		0	0		0	0	
Greenville	0		0	0	0	1	0	2	1	3	27
Georgia:											
Atlanta	1	1	0	0	0	2	0	4	0	0	62
Brunswick	0		0	0	0	0	0	0	0	0	5
Savannah	0		0	1	1	1	0	0	0	1	26
Florida:											
Miami	0		0	0	0	0	0	1	1	8	21
St. Petersburg	0		0	0	1	0	0	0	0	0	16
Kentucky:											
Ashland	5		0	0	0	0	0	0	2	3	8
Lexington	0		0	0	0	0	0	2	0	0	14
Louisville	0		0	2	5	6	0	0	0	21	67
Tennessee:											
Knoxville	0		0	3	0	0	0	1	3	2	20
Memphis	0		0	0	1	2	0	3	0	16	80
Nashville	0		0	0	1	3	0	1	0	13	48
Alabama:											
Birmingham	5		0	0	8	0	0	4	0	6	68
Mobile	0		0	0	0	0	0	2	0	0	26
Montgomery	1			0		0	0		0	0	
Arkansas:											
Fort Smith	0			1		1	0		0	0	
Little Rock	0		0	0	3	0	0	2	0	0	32

City reports for week ended September 6, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	1	0	0	0	0	1	0	8
New Orleans	0	1	1	0	14	2	0	11	0	0	101
Shreveport	0	------	0	0	2	1	0	1	1	0	28
Oklahoma:											
Oklahoma City	0	1	0	0	1	0	0	0	0	0	40
Tulsa	0	------	0	0	3	1	0	0	1	0	37
Texas:											
Dallas	3	------	0	4	0	0	0	2	1	4	61
Fort Worth	2	------	0	0	3	0	0	2	0	4	49
Galveston	0	------	0	0	1	0	0	1	0	1	21
Houston	3	------	0	0	5	0	0	1	3	2	68
San Antonio	0	2	0	1	3	0	0	5	0	2	66
Montana:											
Billings	0	------	0	1	0	0	0	0	0	0	11
Great Falls	0	------	0	1	1	0	0	0	0	2	9
Helena	0	------	0	0	0	0	0	0	0	0	4
Missoula	0	------	0	0	0	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	2
Colorado:											
Colorado Springs	0	------	0	1	1	1	0	1	1	1	15
Denver	7	19	0	2	2	3	0	2	0	57	101
Pueblo	0	------	0	0	1	0	0	0	0	2	6
New Mexico:											
Albuquerque	0	------	0	0	1	0	0	1	0	1	13
Arizona:											
Phoenix	0	3	--------	0	-------	0	0	-------	0	5	--------
Utah:											
Salt Lake City	0	------	0	1	0	0	0	0	0	6	31
Washington:											
Seattle	0	------	0	0	3	7	0	2	0	13	94
Spokane	0	------	0	0	0	0	0	0	0	10	36
Tacoma	0	------	0	1	0	0	0	0	0	1	--------
Oregon:											
Portland	1	------	0	3	1	1	0	2	0	1	58
Salem	0	------	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	3	3	3	7	2	8	0	7	0	34	225
Sacramento	3	------	0	1	0	0	0	1	0	3	28
San Francisco	0	------	0	2	8	3	0	4	0	4	163

City reports for week ended September 6, 1941—Continued

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Polio-myelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Polio-myelitis cases
Maine:				South Dakota:			
Portland	0	0	2	Sioux Falls	0	0	1
Massachusetts:				Maryland:			
Boston	0	0	9	Baltimore	1	0	4
Springfield	0	0	1	Frederick	0	0	1
Worcester	0	0	2	District of Columbia:			
Rhode Island:				Washington	0	0	7
Providence	0	0	2	Virginia:			
Connecticut:				Richmond	0	0	2
Bridgeport	0	0	2	Georgia:			
New York:				Atlanta	0	0	3
Buffalo	2	0	3	Florida:			
New York	4	0	34	Miami	0	0	1
Rochester	0	0	5	Kentucky:			
Syracuse	0	0	1	Louisville	0	1	6
New Jersey:				Tennessee:			
Camden	0	0	1	Knoxville	0	0	1
Newark	0	0	2	Alabama:			
Pennsylvania:				Birmingham	0	0	6
Philadelphia	0	0	11	Mobile	0	0	1
Pittsburgh	0	0	5	Louisiana:			
Ohio:				New Orleans	0	0	1
Cincinnati	0	0	2	Shreveport	0	1	0
Cleveland	0	0	21	Oklahoma:			
Illinois:				Tulsa	0	0	1
Chicago	1	1	6	Texas:			
Michigan:				Galveston	1	0	0
Detroit	0	0	7	Houston	0	0	1
Minnesota:				Utah:			
Duluth	0	0	1	Salt Lake City	0	0	3
Minneapolis	0	0	3	Oregon:			
St. Paul	0	0	9	Portland	0	0	3
Missouri:				California:			
St. Louis	0	0	1	Los Angeles	0	0	2
North Dakota:							
Fargo	0	0	4				

Encephalitis, epidemic or lethargic.—Cases: Philadelphia, 1; Duluth, 2; Minneapolis, 1; Fargo, 3; Billings, 1; Great Falls, 1; Denver, 2. Deaths: Portland, 1; Fall River, 1; Bridgeport, 1; New York, 1; Fargo, 1; Billings, 1.

Pellagra.—Cases: St. Louis, 1; Atlanta, 1; San Antonio, 1.

Typhus fever.—Cases: New York, 1; Charleston, S. C., 1; Miami, 3; Nashville, 1; Birmingham, 2; Lake Charles, 1; New Orleans, 1; Galveston, 1.

Rates (annual basis) per 100,000 population for a group of 88 selected cities (population, 1940, 33,809,812)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
Week ended Sept. 6, 1941	8.3	6.0	1.7	21.1	33.3	30.7	0.0	35.0	6.2	180.4
Average, 1936–40	11.4	5.0	1.7	23.4	40.8	39.6	0.3	50.2	10.8	175.4

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended August 16, 1941.—During the week ended August 16, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1				4		3	1		9
Chickenpox				11	26	12	3	14	9	75
Diphtheria		3	1	18	3			1	1	27
Dysentery				5	6					11
Influenza		6				2	3			11
Lethargic encephalitis						85				85
Measles			1	194	36		23	6	15	275
Mumps				24	27	3	10	7	1	72
Pneumonia	1	1			2	2	3	1	2	12
Poliomyelitis			40	2	9	148	5	25	4	233
Scarlet fever			1	31	41	3	12	15	9	112
Trachoma									1	1
Tuberculosis	6	26	9	78	62	2	20			203
Typhoid and paratyphoid fever			9	19	7		8	2	3	48
Whooping cough	1			112	116	7	36		29	301

COSTA RICA

Poliomyelitis.—During the months of May, June, July, and August 1941, an outbreak of poliomyelitis occurred in Costa Rica. Up to August 26, a total of 24 cases had been reported, of which 13 occurred in the city of San Jose.

CUBA

Habana—Communicable diseases—4 weeks ended August 23, 1941.—During the 4 weeks ended August 23, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	10		Tuberculosis	6	3
Malaria	6	1	Typhoid fever	30	1
Measles	36	1			

JAMAICA

Notifiable diseases—4 weeks ended August 30, 1941.—During the 4 weeks ended August 30, 1941, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		1	Poliomyelitis		1
Chickenpox		6	Puerperal fever		1
Dysentery	1	3	Scarlet fever		1
Erysipelas		1	Tuberculosis	22	88
Leprosy	1	6	Typhoid fever	7	8

Influenza.—Under date of September 4, 1941, an epidemic of influenza of a mild type was reported in Kingston and other parts of Jamaica. The disease is not notifiable and no information as to the number of cases is available.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–June 1941	July 1941	August 1941—week ended— 2	9	16	23	30
ASIA								
China:								
Canton	C	244	70					
Hong Kong	C	997	306	90				
Macao	C	409	132	39		121	79	
Shanghai	C		36	24	74	71	38	143
India:								
Calcutta	C	1,826						
Rangoon	C	57						
India (French)	C	21						
Japan: Taiwan	C	[1] 2						

[1] For February and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

PLAGUE

[C indicates cases; D, deaths]

Place		January–June 1941	July 1941	August 1941—week ended—				
				2	9	16	23	30
AFRICA								
Belgian Congo	C	6						
British East Africa:								
Kenya	C	84	9					
Uganda	C	67						
Egypt: Port Said	C		8					
Madagascar	C	194			2		4	2
Morocco	C	1,488	274	48	54	49	60	83
Casablanca.[1]								
Tunisia: Tunis	C	2						
Union of South Africa	C	59	9					
ASIA								
China: Foochow	C	3						
Dutch East Indies:								
Java and Madura	C	337						
West Java	C	237						
India:								
Calcutta	C	3						
Rangoon	C	6						
Indochina (French)	C	18		1	1			
Palestine: Haifa	C		2					
Plague-infected rats		10						
Thailand: Lampang Province	C	1						
EUROPE								
Portugal: Azores Islands	C					1		
NORTH AMERICA								
Canada: Alberta—Plague-infected ground squirrel		1						
SOUTH AMERICA								
Argentina:								
Cordoba Province	C	[2] 21						
Santa Fe Province—Plague-infected rats		67						
Peru:								
Ancash Department	C	1						
Lambayeque Department	C	2						
Libertad Department	C	6						
Lima Department	C	6						
Moquegua Department—Ilo	C	7						
Piura Department	C	2						
OCEANIA								
Hawaii Territory:[3] Plague-infected rats		44	3					
New Caledonia	C	9						

[1] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco, where several deaths had been reported.
[2] Includes 3 cases of pneumonic plague.
[3] During April and May, 4 lots of plague-infected fleas were reported in Hawaii Territory.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

SMALLPOX

[C indicates cases; D, deaths]

Place		January-June 1941	July 1941	August 1941—week ended— 2	9	16	23	30
AFRICA								
Algeria	C	156	64		24		32	
Belgian Congo	C	214						
British East Africa	C	19						
Dahomey	C	454	10					
French Guinea	C	45						
Ivory Coast	C	32	7					
Morocco	C	62						
Nigeria	C	637						
Niger Territory	C	229	29		4		2	
Portuguese East Africa	C	9						
Rhodesia: Southern	C	86						
Senegal	C	56	3					
Sierra Leone	C	15						
Sudan (Anglo-Egyptian)	C	7						
Sudan (French)	C	19						
Union of South Africa	C	[1] 171						
ASIA								
Ceylon	C	78	30					
China	C	220	11	1	3		1	
Chosen	C	464						
Dutch East Indies—Bali Island	C	3						
India	C	11,513						
India (French)	C	6						
India (Portuguese)	C	44						
Indochina (French)	C	822	73		17		10	16
Iran	C	8						
Iraq	C	989						
Japan	C	200						
Straits Settlements	C	1						
Syria	C	1						
Thailand	C	231	2					
EUROPE								
France	C	1						
Portugal	C	31			1	1		
Spain	C	141	11					
NORTH AMERICA								
Canada	C	22						
Dominican Republic	C	2						
Guatemala	C	5						
Mexico	C	22						
SOUTH AMERICA								
Bolivia	C	[2] 18						
Brazil	C	1						
Colombia	C	373						
Paraguay	C	[2] 8						
Peru	C	778						
Uruguay	C	7						
Venezuela (alastrim)	C	161	2					

[1] For February and April.
[2] For January, February, and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

TYPHUS FEVER

[C indicates cases; D, deaths]

Place		January–June 1941	July 1941	August 1941—week ended— 2	9	16	23	30
AFRICA								
Algeria	C	7,561	1,333		321		196	
British East Africa: Kenya	C	[1] 2						
Egypt	C	4,479						
Morocco	C	637	133	32	27	13	10	6
Sierra Leone	C	5						
Tunisia	C	3,726	632	121	95	117	43	
Union of South Africa	C	224						
ASIA								
China	C	177	13	7				
Chosen	C	225						
Iran	C	105						
Iraq	C	36						
Japan	C	518	1					
Palestine	C	41						
Straits Settlements	C	5	1					
Trans-Jordan	C	6						
EUROPE								
Bulgaria	C	179	12		2	3	1	
Germany	C	1,015	169	20	16	41		
Gibraltar	C	2						
Greece	C	7						
Hungary	C	293	2					
Irish Free State	C	26						
Poland	C	579						
Portugal	C	5						
Rumania	C	578	18	11	9			11
Spain	C	4,367	370					
Switzerland	C	5						
Turkey	C	661						
Yugoslavia	C	78						
NORTH AMERICA								
Guatemala	C	109	16					
Mexico	C	76						
Panama Canal Zone	C	3						
SOUTH AMERICA								
Bolivia	C	[2] 75						
Brazil	C	1						
Chile	C	75						
Ecuador	C	65						
Peru	C	1,079						
Venezuela	C	31	4					
OCEANIA								
Australia	C	8						
Hawaii Territory	C	16	1		1	2		

[1] For the month of April.
[2] For January, February, and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January–June 1941	July 1941	August 1941—week ended— 2	9	16	23	30
AFRICA								
Belgian Congo:								
Kimvulu	C	1						
Libenge	C	1						
French Equatorial Africa:								
Gabon	C	2						
Mayumba	C	4						
Gold Coast: Accra	C	1						
Ivory Coast	C	[1] 3	[2] 1		1			
Spanish Guinea	D	4						
SOUTH AMERICA [3]								
Brazil:								
Amazonas State	D		1					
Bahia State	D	2						
Para State	D	1						
Colombia:								
Antioquia Department	D	2						
Boyaca Department	D	7	1					
Intendencia of Meta	D	4						
Santander Department	D	4						
Tolima Department	D	1						
Peru: Junin Department	C	5						
Venezuela: Bolivar State	C		1					

[1] Includes 2 suspected cases.
[2] Suspected.
[3] All yellow fever reported in South America is of the jungle type unless otherwise specified.

Public Health Reports

VOLUME 56 OCTOBER 3, 1941 NUMBER 40

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE
1798

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease, (3) other pertinent information regarding sanitation and the conservation of the public health.

THE PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • OCTOBER 3, 1941 • *No. 40*

OUR INADEQUATE TREATMENT OF THE MENTALLY ILL AS COMPARED WITH TREATMENT OF OTHER SICK PEOPLE

By Victor H. Vogel, *Passed Assistant Surgeon, United States Public Health Service*

The deplorable conditions in many State hospitals for the mentally ill and the huge costs of this type of illness have been recently discussed in several popular magazines and newspapers of wide circulation (*1*). If, as was said, we have been pound wise and penny foolish with regard to hospital care for mental patients, there are scarcely words available adequately to describe the almost total lack of efforts being made to prevent mental illnesses from occurring or developing to the point where hospitalization is necessary.

What is being done to stem the flow of men, women, and children into mental institutions? What is being done to prevent the breakdown of the 1 child out of every 20 who is now destined to spend some time in a mental hospital? What is being done to treat early disturbances of adults so that commitment may be prevented, and to help the childish old people adjust themselves to the community and the home?

Ordinarily a person ill in the physical sense, except in acute cases, receives considerable medical attention in the physician's office or at home, and hospitalization is reserved as a last resort. Why should mental disorders be an exception to this practice? Why are many mental cases allowed gradually to develop without any medical attention until commitment must be obtained? Why is it necessary for commitment to be sought in order to get medical attention for mentally ill persons? The majority of first admissions to our State hospitals have never seen a mental specialist until they arrive at the hospital, already seriously ill, with only the prospect of sharing a psychiatrist's time with perhaps 400 other patients. Why neglect the mentally ill until they have progressed to commitment to a hospital with only a 50–50 chance of not having to die in a mental institution?

We spend fortunes for hospital care of the end products of mental disturbances but only pittances for prevention. Blindly and foolishly we continue to pay $210,000,000 (*2*) a year of public funds to maintain our mentally ill in hospitals, but only about $5,000,000 (*3*) for the

support of mental hygiene clinics to prevent their commitment. To reverse the old adage about the forest and trees, we haven't been able to see the trees, represented by our individual early cases, because of the forest of mentally ill in the hospitals.

Besides the careless, and perhaps callous, indifference based on ignorance of the true conditions, and lack of appreciation of the magnitude of the problem, there are several reasons why this situation exists. One is the paucity of physicians trained in the care of mentally ill persons. Many cities of 50,000 to 100,000 population have no qualified psychiatrist in practice. Although 58 percent of all hospital beds in this country are occupied by mental cases (*4*), and 50 percent of all cases going to private physicians have emotional or mental disorders as an accompanying condition, only 1.2 percent of all physicians in this country are psychiatric specialists.

Then, too, psychiatrists are concentrated in certain areas, particularly the eastern centers of population. Even if they were distributed evenly according to population, which would provide 1 psychiatrist for every 57,247 persons in this country, in many sparsely settled districts they would be too far apart to be available to the entire population. Furthermore, of about 2,300 psychiatrists in this country, approximately 54 percent are employed in mental institutions, where they are for the most part unavailable for early treatment designed to prevent hospitalization (*5*).

Mental hygiene is peculiarly a job for a mental hygiene clinic team. Besides the psychiatrist, a social worker is needed to make investigations of the environmental conditions of the home, neighborhood, and school to which the patient is trying to adjust himself, and a psychologist is necessary to evaluate the intellect with which the psychiatrist must work in his treatment procedures.

The early treatment of emotional and mental disturbances which may result in incapacitating mental illness and hospital admission and the dissemination of the general principles of living which reduce the number of insolvable conflicts with the environment are the practical aims of mental hygiene. Although some psychoses are due to infections, toxic agents, including alcohol, and the deterioration of old age, most mental disturbances occur when persons are faced with what to them are intolerable situations. These may be overwhelming because of hereditary deficiencies of the individual, a weakness of the personality stamina resulting from educational and environmental forces, or a combination of these two factors. In a fully developed mental disorder this mechanism of flight from reality may be obscure; but it is likely that, at an earlier period, reaction to environmental stresses was shown as a behavior problem in a child or an emotional or neurotic reaction in an adult. The earlier these problems are recognized, the easier it is to correct them. Treatment

of the child's behavior problem or the adolescent's difficulty may prevent a fully developed mental disorder.

Let us consider the distribution of these teams operating as mental hygiene clinics. Since they are specialists and command relatively high salaries, they are found chiefly in the larger centers of population. Full-time clinical service for child guidance is provided in only 27 of the largest cities of the country and is almost nonexistent in small cities and rural areas. About one-fourth of the cities over 100,000 population and almost two-thirds of the cities between 50,000 and 100,000 population have no psychiatric clinic facilities for children or adults (*6*). Even in communities favored by mental hygiene clinics there is none in which the service is adequate to the need. So we see why it is that, today, all over the country, troubled individuals are progressing, or rather, regressing, without benefit of any early medical attention, to the point of hospitalization, with consequent depressing outlook for cure.

Another reason why early medical attention is not obtained for those developing mental illnesses is the unfortunate stigma that is attached to mental disorders of all kinds, a stigma dating back to the days when insanity was believed due to demons and evil spirits, but an anachronism today. Mental illnesses have been recognized by many as deserving of medical attention for some years, but the popular attitude still too frequently attaches a vague disgrace to individuals or families in which mental illness occurs. An unfortunate tendency persists to ignore early mental signs and to avoid facing the issue by consulting a specialist in mental illnesses.

Archaic, persecutory commitment practices, which include court appearances and sometimes jury trials, help to perpetuate this attitude. In too many States the mentally ill are thrown into jail, after which they are transported to the State hospital by sheriffs, who frequently substitute handcuffs, chains, and strait jackets for humane, intelligent handling, which could be furnished by the State hospital attendants. Why should a mentally ill patient be handled as a criminal in order to get for him the treatment that he needs?

In many ways mental disorders and venereal diseases have been placed in the same category in the public mind. Both are too often considered disgraces to individual and family, issues not to be faced but suppressed and concealed as long as possible. Treatment in both types of illness has tended to be long, unsatisfactory, and expensive, and the public has been confused and defrauded by the services of charlatans and quacks. Venereal diseases are now being recognized, by the public as well as the medical profession, as illnesses, apart from moral issues, which can be successfully treated and can perhaps eventually be eliminated as major problems if attacked according to the recognized principles of public health practice.

Venereal diseases can now be mentioned by name in the press and over the radio, and an increasing number of people are able to discuss these subjects frankly and intelligently. Mental illnesses, while lacking specific treatments such as are now available for certain venereal diseases, need no longer be treated by mere isolation and punishment.

Excellent mental hygiene work has been done in certain localities by private foundations, universities, State hospital and welfare groups; but from these scattered random efforts a cohesive national program can never be resolved. The National Committee for Mental Hygiene has been active in a crusade for mental health for more than 30 years. These efforts have included an educational program, the improvement of State hospitals, the development of mental hygiene techniques, with the establishment of demonstration clinics, and fellowships for special study. But it is not the responsibility of such an organization, supported by private subscriptions, to establish adequate mental hygiene service to the Nation any more than it is its function to provide other health services.

The recognition of mental illness as a public health problem offers the support of the Nation-wide system of Federal, State, and local health organizations which can successfully apply the knowledge we now possess concerning the control of this type of illness. Passage of the Federal Social Security Act in 1935 has made it possible for the United States Public Health Service to undertake the development of mental hygiene services as a part of organized health departments throughout the country (7).

Approximately $11,000,000 a year is allocated to the States by the Public Health Service for the extension of general public health work in the States. Under Surgeon General Thomas Parran an effort is being made to direct some of this money into mental hygiene programs, with the ultimate aim of a mental hygiene division in the health department of every State which has not already established an effective program of mental hygiene and a mental hygiene clinic for every community which now has a general public health program. The full-time public health organizations in the 1,665 counties out of a total of 3,071 in the United States may well form the basis for an extensive mental health service.

A mother will take her problem child with less prejudice and with less hesitation to the health center where she has gone for prenatal care and immunizations and vaccinations than she would to the outpatient department of an "insane asylum." The activities of health officers in this field identify mental disorders as problems for the medical profession and problems for which there is some hope in successful early treatment and in prevention.

A mental hygiene clinic is expensive, including as it does several specialists; and it is true that cases cannot be run through a mental hygiene clinic in the same numbers and in the same manner as they can in a vaccination clinic or a venereal disease clinic. But, expensive and time-consuming as mental hygiene efforts are, the results are correspondingly profitable.

These results are profitable with regard to both financial and human, or social, values. If, as estimated, every commitment prevented saves a State from $5,000 to $7,000, it is only necessary to eliminate three commitments a year to correctional institutions or mental institutions to pay the budget of a mental hygiene clinic. There is no doubt that the efforts of such a clinic group throughout a year accomplish this, without taking into account the improved individual and family adjustments in which institutionalization might never be a problem, a divorce saved now and then, and a suicide prevented here and there. One-third of the problems referred to good child guidance clinics are solved, and an additional third are definitely improved.

It was estimated a few years ago in Indiana that if that State's present system of community mental hygiene services were extended to cover the entire State, from 15 percent to 20 percent of patients treated, who would under ordinary circumstances be committed, would not become institutional cases, thus saving the State approximately $583,440 each year. It is estimated that this State could save $284,452 more annually by the discharge of approximately 15 percent of the institutional cases if adequate mental hygiene clinics existed for parole supervision (*8*).

The Public Health Service hopes to establish a neuropsychiatric research institute which will investigate some of the unsolved problems in this field of mental health. At the present time the estimated total annual expense for research into nervous and mental diseases in this country is only about $2,000,000 (*9*), a much smaller amount than is justified by the total national cost of mental illness, which amounts to $777,000,000 (*10*) every year, including both maintenance costs and economic loss due to unemployment. The Federal Government alone has paid out close to $1,000,000,000 (*11*) for the care and pensioning of neuropsychiatric veterans of the last war.

The mental hygiene consultant of the Public Health Service is finding ready acceptance among the State health officers of responsibility in this field of mental disorders. Since none of the money available under the Social Security Act as grants-in-aid to the States is earmarked for mental hygiene purposes, readjustment of State budgets, with a decrease in the amount spent for other health purposes, is necessary in order to establish mental hygiene programs.

Difficult as this rearrangement is, it is being done in 12 States for the fiscal year 1942, as compared with 4 which previously had a mental hygiene program in the State health department.

A special training program to equip men to do this type of work is being started at one of the leading universities this year, and a limited number of fellowships using Federal funds are available through State health departments.

The President's Committee on Medical Care, reporting in 1938, recommended that Congress make available increasing amounts up to $10,000,000 a year for a field program of mental hygiene similar to special annual appropriations for venereal disease control. Appropriations for this purpose, however, have not been made.

In tumultuous, troubled times such as we are now experiencing, and in the days ahead, when joy gives way to anxiety and hope gives way to despair, an increase in mental disease is to be expected. Neuropsychiatric conditions are the fifth most important cause for rejection by the Selective Service boards and have resulted in approximately 63,000 men, up to May 1, 1941, being thrown back into community life with known nervous and mental disorders (*12*). Most of these individuals will receive no attention, although many of them are early cases in which treatment would be most promising.

The post-war period will be one of difficult adjustment for men relieved from military duties. It is hoped that we may have some better method of meeting this problem than mere custodial care at the hospital level and pensioning.

Faced with the enormous problem of mental disorders, a country-wide mental hygiene program is not the least of the needs that confront the Nation. Perhaps, just as the present successful campaign against venereal diseases resulted from our experience in the first World War, the present emergency will focus attention on mental disorders and result in a national, all-out, determined attack on this type of illness. It is inconceivable that this huge problem of emotional and mental illness will not eventually have accorded it the interest and financial support that it deserves.

REFERENCES

(*1*) Stern, Edith M.: Our ailing mental hospitals. Survey Graphic, vol. 30, p. 429, August 1941. Abstracted in Reader's Digest, August 1941.
Deutsch, Albert: Study of mental hospitals reveals appalling cruelty. PM, August 4, 1941, et seq.

(*2*) Pollock, Horatio: Mental diseases and social welfare. State Hospitals Press, Utica, N. Y., 1941. Page 83.

(*3*) Davis, Michael M.: Mental health. The Science Press, Lancaster, Pa., 1939. Page 167.

(*4*) Hardy, John N.: Mental Hygiene Bulletin. Michigan Society for Mental Hygiene, March–April, 1941.

(*5*) Davis, Michael M.: Mental health. The Science Press, Lancaster, Pa., 1939. Page 169.

(*6*) Report of President's Committee on Medical Care, 1938.

(*7*) Vogel, Victor H.: Mental hygiene in the State health department. Pub. Health Rep., vol. 56, p. 1, January 3, 1941. Reprint No. 2221.

(8) Bahr, Max A.: A diagnostic clinic and community service as a State hospital function (Indiana).
(9) Research in mental hospitals. The National Committee for Mental Hygiene, 1938. Pages 7–8.
(10) Pollock, Horatio: Mental diseases and social welfare. State Hospitals Press, Utica, N. Y., 1941. Page 84.
(11) Cooley, Martin J.: The economic consequences of inadequate psychiatric examination. Psychiatry, vol. 4, p. 261, May 1941.
(12) Britten, Rollo H., and Perrott, George St. J.: Causes of physical disqualification under the selective service law. Pub. Health Rep., vol. 56, p. 1017, May 9, 1941. Reprint No. 2276.

DERMATITIS FROM CUTTING OILS [1]

By Louis Schwartz, *Medical Director, United States Public Health Service*

Cutting oils are the most frequent causes of dermatitis among machinists and metal workers.

Cutting oils are divided into two large groups, the insoluble and the soluble. The insoluble ones are used mainly as lubricants, aiding the tools in the cutting operation, and the soluble ones are used mainly as cooling agents. Mineral oils and greases are also used in machine shops for lubricating moving parts and for rust prevention: These oils and greases may produce the same types of lesions as the cutting oils.

The soluble cutting oils in general consist of mineral oil about 60 to 95 percent, soap about 5 to 30 percent, and volatile matter from 0 to 10 percent.

The mineral oil content may be a paraffin or naphthenic type of oil. The soap content may consist of sodium or potassium salts, of fatty acids, rosin, sulfonic acids or sulfonated vegetable or animal oils. The soluble oil may contain more than one type of soap and the proportions vary with individual manufacturers.

The volatile contents consist of materials which are used as mutual solvents or cutting agents which stabilize the mixture of oil and soap. They may consist of alcohol or glycol phenol, nitrobenzene, cresol, and similar materials and water. Some of these compounds serve to inhibit the growth of bacteria and fungi in the oil.

The principal function of a soluble oil is that of cooling the cutting tools so that they do not lose their temper and break or chip; the secondary function is that of lubricating. Soluble cutting oils are mixed with water, in varying proportions (3 to 60 parts of water per part of oil) and allowed to flow continuously over the cutting operation.

The insoluble cutting oils—fatty oils, such as lard oil—were first used to lubricate cutting tools. Since petroleum has become generally available, it has been added to or substituted for these fatty oils in order to offset their high cost and their tendency to turn rancid.

[1] From the Division of Industrial Hygiene, National Institute of Health.

Sulfur was chemically combined with the mineral oil-fatty oil blend to increase the film strength and to provide the added lubrication which was needed for cutting tougher steels and at higher speeds.

The insoluble type of cutting oil consists principally of 55 to 100 percent of mineral oil, 0 to 30 percent of fatty oil, 0 to 10 percent of sulfur, and 0 to 5 percent of chlorine. The mineral oil content may be of a paraffin or naphthenic type. The fatty oil content may be oleic acid, lard oil, fish oils, and vegetable oils. The purpose of the fatty oil is to act as a sulfur carrier and to increase the lubricating properties of the oil. The presence of the sulfur enables deeper cuts to be made in the metal without harming the cutting edge. Chlorine performs, in general, the same function as sulfur, but tends to cause corrosion and rusting of steel.

Firms that sell the vegetable or animal oils to the cutting oil manufacturers may incorporate into them chemicals known as inhibitors, which prevent the oil from becoming rancid. These inhibitors must be of a type that will not rust iron and are frequently phenolic compounds of the type of phenolic amines. The insoluble cutting oils may also contain small percentages of these inhibitors.

ACTION OF CUTTING OILS ON THE SKIN

All petroleum oils have the property of defatting the skin. The defatting action is somewhat lessened by the animal or vegetable content of the cutting oil, but since these oils are contained in comparatively small percentages in cutting oil, their action does not altogether counteract the defatting action of the mineral oil content. All oils may plug up pores of the skin and form comedones.

The chlorine content may be sufficiently high to irritate the skin.

The sulfur content of a cutting oil may cause a dermatitis because of the actual effect of the sulfur itself on the skin, or because the sulfur may be converted into such compounds as hydrogen sulfide or sulfur dioxide by the action of the heat generated by the cutting operation.

The animal or vegetable oils, especially when they are rancid, may irritate or sensitize the skin of some of the workers.

The phenols, cresols, nitrobenzene, and other inhibitors are usually not present in sufficient amounts to be primary irritants, but they may act as sensitizers and cause allergic eczemas.

The type of skin has a marked influence on the worker's susceptibility to dermatitis from the cutting oils. A greasy skin having active sebaceous glands is less apt to be defatted than is a dry skin. A smooth, hairless skin is less apt to develop comedones than a hairy one.

Cutting oils, after being used, contain many steel slivers which

may wound the skin of the workers, especially if old, dirty towels and old, used waste full of slivers are employed for drying the hands.

TYPES OF DERMATITIS FROM CUTTING OILS

Comedones of the hands and fingers occur in nearly all workers handling cutting oils unless they are particularly careful about washing their hands after work. Folliculitis is the most frequent type of dermatitis caused by cutting oils. Folliculitis occurs generally on the extensor surface of the forearms and of the thighs where oil-soaked sleeves and trousers have closest contact with the skin. The bacteria found in the lesions are usually the pathogenic staphylococci, which are usually found in ordinary boils and which may be found on the intact skin. It is true that workers sometimes expectorate into cutting oils and that the oils may even be contaminated with the colon bacillus. However, we believe that it is the bacteria on the skin which causes the folliculitis from cutting oils and not the bacteria which may be in the oil. The United States Public Health Service has analyzed samples of sterilized and unsterilized insoluble cutting oils used by workers who have had cutting oil dermatitis and found no significant number of staphylococci or streptococci. A large square-end, rod-like organism containing spores and some indefinite forms suggestive of yeasts and molds were found in the samples.

The insoluble cutting oils as a class are not suitable for the growth of bacteria because they contain such a large percentage of petroleum oil and because many of them also contain an inhibitor which has antiseptic properties. Soluble petroleum oils, when diluted for use, are not well suited as culture media because of the fact that they consist mostly of water and a small percentage of the soluble oil. It is possible, however, for bacteria to grow in those having a high content of fatty oils. The lard oils contain animal or vegetable oils and therefore bacteria grow more easily in them. (Lee and Chandler [3] described a short Gram-negative rod which they found in cutting oils and which they called *Pseudomonas oleovorans*. This organism has not been shown to be a pathogen.)

Infected follicles may develop into boils and even carbuncles and infection of wounds of the skin caused by metallic slivers may cause the development of boils or even cellulitis. Bacteriologic examination of the infected follicles or boils usually shows the ordinary pyogenic bacteria, which are found in ordinary boils and which are usually present on the skin.

The defatting action of cutting oils on the skin may cause drying, cracking, and fissuring. The open fissures are subject to secondary infection and its train of symptoms—boils, lymphangitis, and even

[3] Lee, Melba, and Chandler, Asa C.: A study of the nature, growth and control of bacteria in cutting compounds. J. Bact., 41: 373 (1941).

septicemia. Dry skins and senile skins are most likely to be affected in this manner because the skin glands are not sufficiently active rapidly to replace the fat extracted from the skin by the mineral oils.

Metal slivers in the oils and in the waste used for drying the hands often become imbedded in the skin and may be the site of secondary infection.

Some of the mineral oils have keratogenic properties and cause the appearance of small, flat, brownish papillomas on the hands, arms, and other parts touched by the oil or oil-soaked clothing. We have found that about 10 percent of all workers in oils and greases have these growths. They are usually not troublesome and the worker may not be aware of their presence.

Certain mineral oils are carcinogenic, but fortunately the mineral oils of North America are low in carcinogenic properties. Nevertheless a few cases of skin cancer are caused in the United States by mineral oils. Cancers caused by oils are usually of the prickle cell type. They are usually multiple and occur on the parts exposed to the oils or the oil-soaked clothing, the hands, arms, neck, and scrotum. They do not as a rule have early metastases.

Allergic eczemas are the least frequent types of cutting oil dermatitis. They are caused by hypersensitivity to the animal or vegetable oil, or inhibitor contained in the cutting oil, or by allergy induced by the disinfectant, which in many instances is added to cutting oils when they become rancid. We have seen cutting oils that contain as high as 5 percent of a phenolic disinfectant which had been added to it from time to time during the prolonged period that the cutting oil was in the machine.

Dermatitis among workers exposed to cutting oils may not be caused by the cutting oil, but by the harsh soaps, bleaches, and solvents which the workers use to wash their hands after work. Careless workers are apt to use such solvents as kerosene and gasoline to remove dirt and grease from their hands quickly. Others will use sand soap, soaps containing a high percentage of alkali, and even such substances as bleaching powder to clean up after work. Skins that are naturally dry will not stand such cleansers without at least becoming chapped or fissured.

PREVENTION

Prevention of dermatitis from cutting oils consists chiefly in cleanliness of the person, of the clothes, of the machines, and of the oil. For personal cleanliness, workers with cutting oils should be provided with adequate washing facilities, hot and cold running water, and shower baths, and they should be compelled to use them under supervision.

Clean work clothes should be provided daily and the anterior

surfaces of the body and the arms should be protected by aprons and sleeves made of impermeable material, such as the new synthetic resins.[3]

Toilet or liquid soaps should be provided for the workers and placed in convenient locations in the wash room. There should also be provided places where workers who have dry or fissured skins, or acute or chronic dermatitis can wash after work with a cleanser that will not further defat or irritate the skin. Such a cleanser has been devised and consists of a neutral sulfonated castor oil, to which 2 percent of a wetting agent such as a fatty alcohol sulfate is added.[4] The sulfonated castor oil is a good emulsifier and the wetting agent is a good detergent and works in hard or soft water. Its defatting action is counteracted by the sulfonated castor oil. If it is desired to remove dyes or stains from the skin, the addition of 1 to 2 percent of trisodium phosphate or sodium hexametaphosphate to this mixture will increase its cleansing powers and not materially increase its irritating powers. The use of kerosene, gasoline, or other fat solvents and strong bleaches and scouring soaps should be prohibited for skin cleansing.

The machines should be kept as free from old grease and dirt as possible by washing daily.

The oil should be changed frequently, at least once a week, and either discarded, or, if it is to be reused, it should be screened to remove metal, sterilized to remove bacteria, and neutralized to remove rancidity. Such sterilization can best be done by a central sterilizing system, connecting with each of the machines, and recirculating the oil, or if this is not possible, the oil may be removed from each individual machine and carried to the central sterilizing system. Additional antiseptics should not be added to used or rancid oils. Such a practice increases the irritating properties of the oil and is not necessary if the oil is filtered, neutralized, and heat sterilized.

Clean towels should be given to the workers every day, or they should have free access to clean waste. The towels should be so laundered that all slivers are removed. Waste should be discarded and not laundered because it is impossible to remove all slivers from waste.

PROTECTIVE OINTMENTS

Since the most frequent type of occupational dermatitis caused by cutting oils is a folliculitis and boils, cleanliness is much more important in the prevention of dermatitis than are protective ointments. When protective ointments are used, they should be of the type that will fill the pores of the skin with an innocuous vegetable or

---

[3] Schwartz, Louis, Warren, Leon H., and Goldman, Frederick H. Clothing for protection against occupational skin irritants. Pub. Health Rep., 55: 1158–1163 (1940).

[4] Schwartz, Louis: A new industrial skin cleanser. Pub. Health Rep., 56. 1788–1790 (1941).

animal fat to prevent the entrance of the mineral oil. Such an animal or vegetable fat will also act to protect the skin from the defatting action of the mineral oil, because the mineral oil must first dissolve out the protective ointment before it will act on the fat of the skin. Such a protective ointment should also contain a small percentage of a wetting or emulsifying agent such as the fatty alcohol sulfates, in order to make it easily removable from the skin with water. A small percentage of a harmless preservative, such as sodium perborate, is also desirable in order to prevent the fat in the ointment from becoming rancid.

Protective ointments which form films on the skin, insoluble in oil, are not as good as are those described above, because films insoluble in oil are soluble in water and the perspiration which forms beneath them washes them off. Protective ointments which form films soluble in oil are not desirable because the cutting oil washes them off. The sulfonated oils will wash away both types of films. Films will crack when the hands and fingers are flexed and leave areas of the skin unprotected.

Workers should be prohibited from expectorating into the oil, or from contaminating it in any other way.

EDUCATION

The safety director or the physician in charge of the medical service of the plant should make it his duty to give occasional lectures to the workers as to the hazards of dermatitis from cutting oils and make them acquainted with the methods of prevention outlined above. In this educational program, the placing of placards in suitable places calling the attention of the worker to the dermatitis hazards of cutting oils and the methods of prevention has been found to be effective.

DIFFERENTIAL DIAGNOSIS

Cutting oil folliculitis and boils must be differentiated from folliculitis, boils, and furunculosis occurring from nonoccupational causes. Cutting oil folliculitis and boils occur on parts of the body where there is most frequent contact with the cutting oils or with soiled clothes. The extensor surfaces of the forearms, thighs, and legs are the favored sites of cutting oil dermatitis. The condition may, however, occur on other parts of the body coming in contact with oil-soaked clothing. Nonoccupational boils usually occur on other portions of the body, such as the back of the neck and the back. Occupational folliculitis and boils are usually multiple, whereas nonoccupational types are more apt to be a succession of solitary boils or furuncles. In occupational folliculitis and boils, evidences of oil comedones can usually be seen on the parts affected. These do not occur in nonoccupational types.

In differentiating the allergic eczematoid type of cutting oil dermatitis from eczemas of unknown origin, the site of the lesions must be considered, as well as the result of patch tests with the oil. Allergic occupational eczemas due to cutting oil usually begin on the arms and hands or on parts of the body which have contact with oil or oil-soaked clothing. Patch tests with the particular cutting oil handled by the worker should be positive if the oil is the cause. Such positive patch tests should be followed with patch tests with each of the ingredients of the cutting oil to determine the actual chemical in the oil to which the worker is sensitive.

Fungus infections and phytids of the hands and forearms offer a difficult problem in differential diagnosis, but here again patch testing in conjunction with the history, site, and morphology of the lesions will usually lead to a correct diagnosis.

TREATMENT

Comedones, folliculitis, and boils caused by cutting oils can be successfully treated by cleanliness and antiseptics. Cleanliness consists in a daily change of work clothes and frequent washing of the parts affected. Pus should be evacuated by surgical means and moist dressings of solutions of boric acid, bichloride of mercury 1 to 1,000, or potassium permanganate 1 to 2,000, if judiciously used, will usually clear up the condition.

The allergic types of cutting oil dermatitis are best handled by removing the affected worker from contact with cutting oils and then treating the dermatitis. Antiseptic lotions should be used for the moist types of dermatitis and ointments for the dry, chronic types. Moist dressings of boric acid, Burow's solution, bichloride of mercury 1 to 1,000, and the like, for the acute moist types, and boric acid ointment, zinc ointment, Lassar's paste, and coal tar preparations are suggested for the dry stages or dry eczematoid types.

For dry, defatted skins an ointment consisting of a vegetable or animal fat should be given the worker to rub into his hands before and after work. The ointment suggested above as a protective may also be used for this purpose.

THE LEAD AND ARSENIC CONTENT OF URINES FROM 46 PERSONS WITH NO KNOWN EXPOSURE TO LEAD OR ARSENIC[1]

By Stewart H. Webster, *Biochemist, United States Public Health Service*

A recent investigation of the lead and arsenic content of the blood and urine from a large number of individuals living in an apple growing

[1] From the Division of Industrial Hygiene, National Institute of Health

locality in the State of Washington has been reported (*1*). All of the 683 individuals, for whom analyses were made, had a potential exposure to lead arsenate either by ingestion of apples having on their surface some lead arsenate spray residue and/or by inhalation of dust, spray, or particulate matter containing lead arsenate. The number of persons eating no apples at any time during the year was so small that a satisfactory control group could not be found among the individuals studied.

The purpose of the present investigation was to secure urinary lead and arsenic values for children and adults having no known exposure to lead or arsenic and to compare the values with those for similar groups.

A group of 46 individuals working in or living near the National Institute of Health, Bethesda, Md., was studied. These persons were either personnel of the laboratory staff or members of their families. None of these, so far as it could be ascertained, had had any appreciable exposure to lead or arsenic compounds.

From 28 adults (27 males and 1 female) and 18 children (14 boys and 4 girls) from the households of some of these adults, morning specimens of urine were collected during the month of March. Lead- and arsenic-free bottles were issued on a given day and the individuals were requested to fill the bottles (250-cc. capacity) with the first morning specimen passed the following morning and return it to the laboratory. Nearly all the adults filled the bottles on the first voiding; the remainder made subsequent additions until 250 cc. were obtained. Urine was collected from the children 2 to 4 days later and the same care was taken to avoid contamination of the specimens. With most of the children, however, several voidings were necessary to fill a bottle.

Analyses of these specimens were started on the same day they were brought to the laboratory. The condition and color of each specimen was noted and recorded, the pH and specific gravity were measured, and the phosphate, lead, and arsenic content was determined. The modified Leconte uranium acetate method (*2*, *3*) was used for total phosphate analyses, a photometric dithizone method for lead (*1*, *4*), and the Gutzeit method (*1*) for arsenic.

EXPERIMENTAL RESULTS

The determinations made on the specimens are summarized in table 1 which gives both the minimal and maximal as well as average values. It can be seen that the urines for the two groups are remarkably similar both in range and in average values. The averages for the pH measurements on the two groups may differ significantly (critical ratio of the two means=2.5); for all the other kinds of determinations shown the averages do not differ significantly for corresponding groups (critical ratios of means are less than 2.0). However, this

similarity in values for adults and children holds only with average values for groups since a child with a specimen showing a low concentration for a given constituent frequently comes from a family in which the parent's specimen shows a considerably elevated concentration value for the same constituent. This can be seen from inspection of table 2 in which urinary lead concentration values are compared for corresponding members of families.

TABLE 1.—*Analytical findings for 46 residents of Bethesda, Md., having no known exposure to lead or arsenic*

Measurement	Range in values		Average values		
	Children	Adults	18 children	28 adults	Group of 46
Age	2-12½	21-52	7½	33	23
pH	5.2-6.8	5.2-6.7	6.1	5.8	5.9
Specific gravity	1.007-1.025	1.006-1.027	[1] 1.018	1.016	[2] 1.017
P_2O_5(g./100 cc.)	.06-.43	.06-.31	.22	.19	.20
As (mg./l.)	.000-.065	.000-.060	[1] .014	[3] .015	[4] .014
Pb (mg./l.)	.000-.048	.008-.051	[1] .026	.030	[2] .028

[1] Based on 17 observations.
[2] Based on 45 observations.
[3] Based on 26 observations.
[4] Based on 43 observations.

Similarly, considering urinary arsenic concentration values, in nine families for which specimens from one parent and the child (or children) were available, the child of the parent with the highest urinary arsenic concentration showed no urinary arsenic while the parent of the child with the highest value had no detectable quantity of arsenic in the specimen examined. However, the mean arsenic values for the two groups, adults and children, were practically identical, being 0.013 and 0.014 mg. per liter, respectively.

TABLE 2.—*Comparison of urinary lead concentration values for parent and child or children in corresponding families*

Family number	Urinary lead concentration in mg. per liter		Family number	Urinary lead concentration in mg. per liter	
	Parent	Child or children		Parent	Child or children
1	0.051	0.010	8	0.036	0.023
2	.018	.020, .035	9	.046	.015, .032
3	.038	.037	10	.008	.041
4	.018	.011			
5	.015	0.048, .035, .011	Total number	10	16
6	.015	0.041, .019, .030			
7	.046	.005	Average	0.029	0.026

It is evident, therefore, that similarity of environmental conditions existing within a household is not sufficient to produce uniformity in the urinary lead or arsenic concentration measurements of different members of a given family. Statistical treatment of the data, together with other experimental work to be reported later, give results which are consistent with the existence of diurnal variation in the urinary lead excretion of the individual studied.

Although both the urinary lead and urinary arsenic values for the groups of children and adults showed no significant differences between the groups at this time of year it is not certain that this equality will be realized at a different time of year when the average temperature is greatly increased. Measurements have been made in this laboratory at cold and warm periods of the year which indicate that the total daily output of urine may decrease as much as 48 percent during hot weather in spite of increased water consumption at that time. Unless the intake and output of water remain essentially the same for adults and children during hot weather it is unlikely that the concentration values will remain equal for the two groups.

It is of interest to note some of the references found in the literature dealing with common sources that may be responsible for the lead and/or arsenic found in nearly all of the specimens analyzed. Some, although not all, foods have been found to contain measurable amounts of lead and/or arsenic (*5*, *6*) and the increased arsenic content of some sea-food and related products has been studied (*10*, *11*). The lead content of air and of some types of gasoline (*7*, *8*) and of certain drugs (*9*) has also been investigated. Finally, the lead and/or arsenic content of tobacco has received some attention (*12*, *13*, *14*, *15*).

The eating, smoking, and drinking habits of the 46 persons studied in the present investigation naturally varied widely. About three quarters of the adults are occasional or inveterate users of tobacco. However, substantial agreement of urinary lead and arsenic values for the groups of children and adults appears to indicate that the consumption of tobacco has little effect on the concentration of these elements in the urine. Furthermore, apples do not form a large part of the diet of the individuals concerned so that this dietary item would not be expected to contribute a large share of the lead and arsenic found in the specimens.

Analyses of three sets of drinking water samples were made in an effort to evaluate the potential quantities of lead from this source. Lead was determined by the dithizone method (*1*) on 500 cc. samples. The average values for duplicate analyses are given in table 3. Sample No. 1 was obtained from a drinking fountain used by the laboratory personnel, No. 2 from a private well used by one of the families, and No. 3 from a faucet in a newly built dwelling occupied by one of the families.

TABLE 3.—*Lead content of samples of drinking water*

No.	Mg. of lead per liter
1	0.004
2	.002
3	.033

The quantities of lead ingested in the course of a day from the first two water samples must be regarded as of negligible importance. The highest value found in drinking water (No. 3) was only a third of the United States Public Health Service (Treasury Department) limit of 0.1 mg. of lead per liter for drinking water supplied by interstate carriers (*16*). The possibility of lead in water in houses having new plumbing is recognized (*17*). Careless use of lead compounds used to calk pipe threads may result in leaving comparatively large

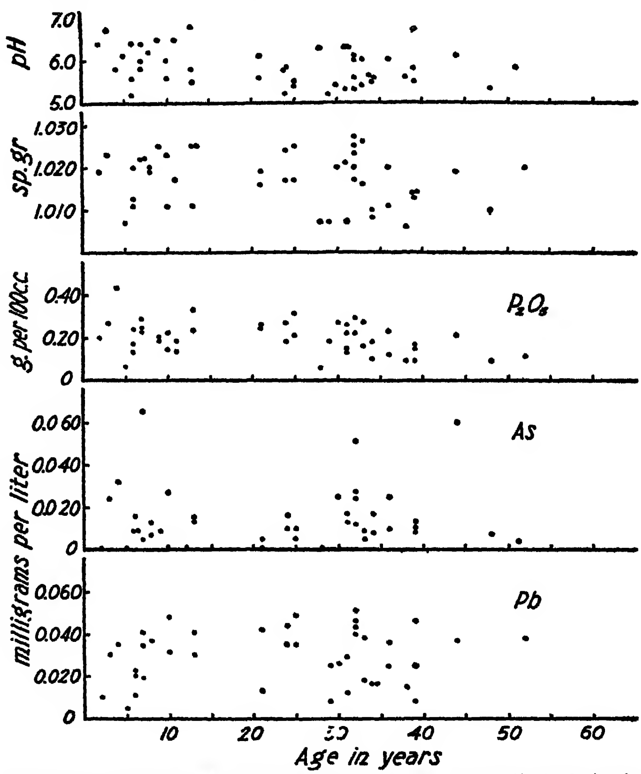


FIGURE 1.—Variation of certain urinary measurements with age of 46 individuals having no known exposure to lead arsenate.

amounts of these substances in the pipes in contact with water. Under these circumstances the water standing in the pipes may contain much more lead than a sample taken after the water has been allowed to flow (*22*). The not infrequent practice of using for drinking or culinary purposes the hot water derived from a domestic tank supply has also received attention.

The average values for urinary lead excretion for the two families for which the water analyses were available were identical within the limits of experimental error, being 0.024 and 0.026 mg. per liter, respectively.

Considering the urine measurements in more detail, the individual

values for the hydrogen ion concentration (expressed in terms of pH), specific gravity, phosphate (calculated as P_2O_5), arsenic (as As), and lead (as Pb) concentrations are given in figure 1, where these measurements are plotted against the age of the individuals concerned. It can be seen that age trends are not prominent. It will be noted also that all of the individuals [2] had an appreciable quantity of lead in the urine and all but four (2 children and 2 adults) had a measurable quantity of urinary arsenic. The comparatively large var-

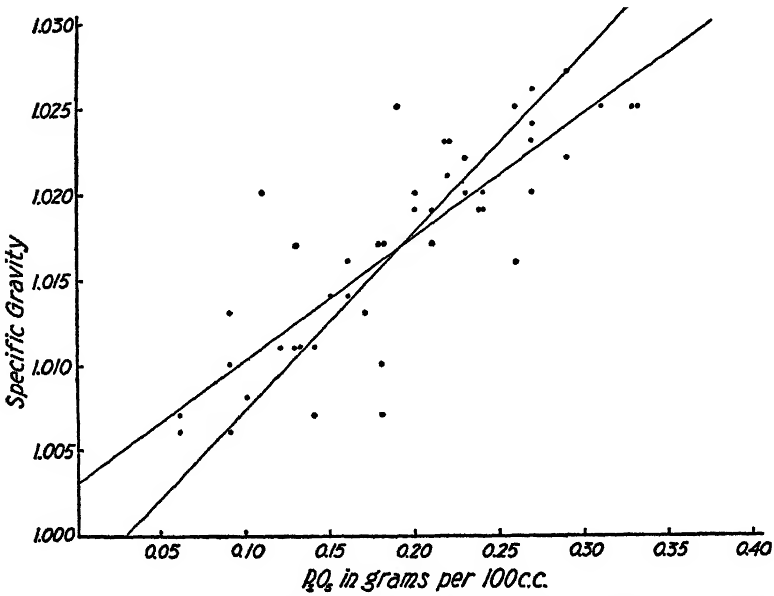


FIGURE 2.—Relation between specific gravity and P_2O_5 concentration of urine (based on urine specimens from 45 individuals).

iation for concentration ranges with lead, arsenic, and phosphorus is likewise of interest.

Scatter diagrams, made by plotting one set of measurements in turn against another set, failed to reveal any close correspondence between the five variables except in one case. Figure 2 shows such a diagram for specific gravity and P_2O_5 values. This is of interest in connection with the known dependence of the specific gravity on the urea and sodium chloride content (*18*). The regression lines shown in the figure are obtained by the method of least squares, using first the specific gravity and then the phosphate concentration as the independent variable. This diagram indicates a marked tendency for the specific gravity to increase as the phosphate content increases.

From the random nature of the scatter diagrams for lead and arsenic concentration values it is probable that the small quantities of lead

[2] Lead and arsenic were determined on 45 and 43 specimens, respectively.

and arsenic found in the urines of nearly all the individuals studied are not derived largely from lead arsenate.

Finally, it is of interest to compare the urinary lead and arsenic values for the groups included in this study with those for men and women among the consumer groups studied in Wenatchee, Wash., (*1*) at comparable times of the year. Of these 98 Wenatchee residents none had occupational or industrial exposure to lead arsenate but all but 6 percent ate apples which had been sprayed with lead arsenate containing material. The average yearly consumption was estimated to be about 300 apples per person, the men consuming about 10 percent more and the women about 10 percent less than this figure. Table 5 shows the average values for urinary lead and arsenic concentrations. It appears that the difference in urinary arsenic excretion for the Bethesda and Wenatchee residents may be explained both by the high consumption of apples by the latter group and also by the rapid elimination of arsenic from the blood stream by way of the kidneys. The earlier rise of the urinary arsenic levels and the relatively small influence of the consumption of apples on the urinary lead levels which have been shown elsewhere (*1*) appear to explain satisfactorily these group differences.

TABLE 5.—*Comparison of average urinary lead and arsenic concentration values for 4 groups of persons with no known industrial or occupational exposure to lead or arsenic*

Location	Group	Urinary lead		Urinary arsenic	
		Number of analyses	Mg /l.	Number of analyses	Mg /l.
Bethesda, Md	Children	17	0.026	17	0.014
Do	Adults	28	.030	26	.015
Wenatchee, Wash	Women	57	.029	55	.041
Do	Men	41	.035	40	.030

SUMMARY AND CONCLUSIONS

The urinary lead and arsenic concentration values were determined on morning specimens from 46 persons (28 adults and 18 children) having no known exposure to lead arsenate. Urinary phosphate, pH, and specific gravity measurements were also made. A wide range in concentration values and in other determinations was found. The children showed nearly the same range of values as the adults, the averages for the children being slightly less than for the latter group. However, no uniformity was found in the urinary lead or arsenic measurements for different members of a given family. A close correspondence between specific gravity and phosphate concentrations of the urine specimens was shown.

Comparison was made of lead and arsenic values for the 46 nonexposed individuals in this study and for men and women of the pre-

viously studied consumer groups in the lead arsenate spray residue investigation. These figures showed about the same average lead values for the four groups but significantly lower average urinary arsenic values for the groups living outside of the apple growing district.

In this experiment, with a population having no known occupational or industrial exposure to lead or arsenic, no evidence was discovered to indicate that children as a group differ significantly from adults in their urinary lead and arsenic concentration values.

ACKNOWLEDGMENTS

The author wishes to thank Passed Assistant Surgeon Harold T. Castberg for aid in collecting the urine specimens and for drawing the figures, Assistant Chemist William F. Knop for help in the lead analyses, Junior Medical Technician Stuart W. Jones for assistance with the arsenic analyses, Junior Chemist Frances L. Hyslop for assistance with lead and other determinations and for help in preparing the manuscript, Senior Statistician William M. Gafafer and Associate Technical Editor Thomas I. Edwards for consultation and advice, and finally all those donors whose cooperation made this study possible.

REFERENCES

(*1*) Neal, P. A., Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Webster, S. H., Castberg, H. T., and Fairhall, L. T.: A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bulletin 267, Government Printing Office, 1941.

(*2*) Leconte, Ch.: Recherches sur l'analyse qualitative et quantitative de l'acide phosphorique. Comp. rend., **29:** (No. 2) 55–56 (1849).

(*3*) Hawk, P. B., and Bergeim, O.: Practical Physiological Chemistry. 10th ed. Blackiston, 1931. Page 876.

(*4*) Dreessen, W. C., Edwards, T. I., Reinhart, W. H., Page, R. T., Webster, S. H., Armstrong, D. W., and Sayers, R. R.: The control of the lead hazard in the storage battery industry. Public Health Bulletin 262, Government Printing Office, 1941.

(*5*) Monier-Williams, G. W.: Lead in Food. Report on Public Health and Medical Subjects No. 88. Ministry of Health, H. M. Stationery Office, London, 1938.

(*6*) Kehoe, R. A., Cholak, J., Hubbard, D. M., Bambach, K., McNary, R. R., and Story, R. V.: Experimental studies on the ingestion of lead compounds. J. Ind. Hyg., **22:** 381–400 (1940).

(*7*) Bloomfield, J. J., and Isbell, H. S.: The presence of lead dust and fumes in the air of streets, automobile repair shops, and industrial establishments of large cities. J. Ind. Hyg., **15:** 144–149 (1933).

(*8*) Leake, J. P., Kolb, L., Schwartz, L., et al.: The use of tetraethyl lead gasoline in its relation to public health. Public Health Bulletin 163, Government Printing Office, 1926.

(*9*) Bambach, K.: Estimation of traces of lead and thallium in pharmaceutical chemicals. J. Ind. Eng. Chem., Anal. Ed., **12:** 63–66 (1940).

(*10*) Coulson, E. J., Remington, R. E., and Lynch, K. M.: Toxicity of naturally occurring arsenic in foods. Science, **80:** 230–231 (1934).

(*11*) Holmes, A. D., and Remington, R. E.: Arsenic content of American cod-liver oil. J. Ind. Eng. Chem., **26:** 573–4 (1934).

(*12*) Remington, R. E.: A hitherto unsuspected source of arsenic in human environment. J. Am. Chem. Soc., **49:** 1410–1416 (1927).

(*13*) Popp, H.: Vorkommen von Arsen im Tabak. Z. angew. Chem., **41:** 818–839 (1928).

(14) Zeidler, F. A. J., and Wagner, W. J.: The lead and arsenic content of Canadian domestic tobacco. Can. Pub. Health J., 28: 582–586 (1937).
(15) Barksdale, E. E.: Cutaneous manifestations from tobacco. J. Am. Med. Assoc., 115: 672–676 (1940).
(16) Report of Advisory Committee on Official Water Standards. Pub. Health Rep., 40: 693–722 (1925).
(17) Kruse, W., and Fischer, M.: Bleivergiftungen durch Trinkwasser im allgemeinen und in Leipzig. Deut. Med. Wchnschr. 56: 1814–1818 (1930).
(18) Rowe, A. W.: Note on the calculation of urine solids. J. Lab. and Clin. Med., 17: 466–470 (1931–32).
(19) Aub, J. C., Fairhall, L. T., Minot, A. S., and Reznikoff, P.: Lead Poisoning. Williams and Wilkins, Baltimore, 1926.
(20) Litzner, S., Weyrauch, F., and Barth, E.: Untersuchungen über Bleiausscheidung durch die Nieren und ihre Beeinflussung durch bestimmte Kostformen und Arzneimittel beim Menschen. Arch. f. Gewerbhyg., 2: 330–344 (1931).
(21) Webster, S. H.: Diurnal variation of urinary lead excretion. Pub. Health Rep., 56: 1834 (1941).
(22) Kehoe, R. A., Thamann, F., and Cholak, J.: On the normal absorption and excretion of lead. III. The sources of lead absorption. J. Ind. Hyg., 15: 290–300 (1933).

RAT-BITE FEVER IN WASHINGTON, D. C., DUE TO *SPIRILLUM MINUS* AND *STREPTOBACILLUS MONILIFORMIS*[1]

By Carl L. Larson, *Assistant Surgeon, United States Public Health Service*

Rat-bite fever has been recognized as a clinical entity for a considerable time, but the causative agent has only recently been discovered. Robertson (*1*) states that the disease was described in the United States as early as 1840 by Wilcox and Watson. The discovery of *Spirocheta morsus muris* was made by Futaki and his associates (*2*) in 1916. Carter (*3*) had applied the term *Spirillum minus* to the organism which he observed in the blood of a naturally infected rat in 1887.

The disease is of world-wide distribution. In 1931, Bayne-Jones (*4*) reviewed the literature and found that there had been 81 cases in 23 States in the United States prior to that time. The first patient in this country from whom *S. minus* was recovered was reported by Shattuck and Theiler (*5*). The number of cases diagnosed on etiologic grounds increased slowly and, in 1932, Francis (*6*) noted that his patient was the sixth one so studied. Leadingham (*7*) had 5 individuals with rat-bite fever under his observation and *S. minus* was detected by animal inoculation in three instances. He states, "* * * the *Spirillum minus* has been identified with a clinical syndrome sufficiently characteristic to permit restriction in the use of the designation 'rat-bite fever' or 'sodoku' to the disease caused by this organism." There have been 19 previous cases in the United States from which the organism has been isolated (*4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16*).

[1] From the Division of Infectious Diseases, National Institute of Health.

Kaneko and Okuda (*17*) studied 2 human cases which came to autopsy. Liver damage was the most marked pathologic finding and spirillae were present in the kidney.

As no practical serological tests are available and *S. minus* has not been cultivated in artificial media, the diagnosis of rat-bite fever depends upon clinical evidence and inoculation of laboratory animals with blood or other materials derived from the patient. Care must be taken in interpreting the results of animal tests as *S. minus* may be present as an inapparent natural infection in the animals. Francis (*18*) pointed this out among mice and das Gupta (*19*) described a natural infection in a guinea pig.

S. minus has not been universally accepted as the cause of rat-bite fever. The controversy regarding this was opened in 1916 when Blake (*20*) published a report of a case from which *S. minus* could not be isolated. He obtained pure cultures of a streptothrix from the patient and pointed out the similarity with Schottmuller's results. At autopsy, Blake's patient presented myocarditis, endocarditis, interstitial hepatitis, and nephritis. It was apparent that, although the condition appeared to be rat-bite fever on clinical grounds, it was characterized by an entirely different etiologic and pathologic picture. Tunnicliff (*21, 22*) discussed the occurrence of this organism among rats and suggested the name *Streptothrix muris ratti*. Strangeways (*23*) found it in 4 of 6 wild rats and 28 of 46 white rats. Pure cultures of *S. muris ratti* were obtained from 2 human cases by Tileston (*24*). In 1939, Dawson and Hobby (*25*), who had studied 2 patients with rat-bite fever from whom this organism was obtained, cast doubt upon the acceptance of *Spirillum minus* as the etiologic agent of this disease, stating, "Before it can be accepted * * * the spirillum theory requires more critical evaluation than it has yet received."

An outbreak of Haverhill fever (erythema arthriticum epidemicum) which appeared to be a milk-borne infection was investigated by Place and Sutton (*26*). This new clinical entity was characterized by sudden onset, recurrent fever, chills, rash, and arthritis. Parker and Hudson (*27*) studied the organism which was responsible for the outbreak and named it *Haverhillia multiformis* but it appears to be identical with *S. muris ratti*. In addition to these names, the organism has also been termed *Actinomyces muris* and *Streptobacillus moniliformis*.

Allbritten et al. (*28*) in their clinic studied a case of rat-bite fever due to *S. moniliformis*, and after a thorough review of the literature concluded that the disease might be due to either *Spirillum minus* or *H. multiformis* and that the clinical picture varies depending upon the organism involved. When due to the spirillum, a primary chancre, papular or large macular eruption, fever, and rarely arthritis characterize the course of the disease. When the streptobacillus is responsi-

ble, septicemia with arthritis and morbilliform and petechial cutaneous eruptions occur.

In view of the facts which have been brought out, it seems of value to present a series of cases of rat-bite fever which have been observed in Washington, D. C., for they not only include the first record of isolation of *S. minus* from a patient in Washington [2] but also are the only instances of infection with *Streptobacillus* in this locality.

CASE REPORTS

Case 1.—E. G., a colored female infant, aged 3½ months, was bitten on the ring finger of the right hand by a wild rat on July 24, 1940. The wound healed with no difficulty, but 19 days later the finger became red and swollen. By August 16, 1940, the finger showed increased swelling; the forearm was hot and edematous, a number of enlarged nodes appeared in the right axilla, diarrhea developed, and a temperature of 103.6° F. was observed. At this time the child was admitted to the service of Dr. Ong at Children's Hospital, Washington, D. C. Three days later the temperature was 101° F., the axillary lymphadenopathy had disappeared, and the finger was still swollen although no ulcer or break in the skin was apparent. Diarrhea accompanied each bout of fever, and swelling and discoloration of the finger fluctuated with the changes in temperature. At no time did a chancre develop at the site of the rat bite. Following an attack of fever beginning on September 2, the course was one of general improvement. In spite of frequent, careful examinations made with this in mind, no rash was discovered at any time. A significant weight loss occurred during the early part of the illness. The patient was discharged on October 10, 1940. Figure 1 shows the character of the temperature curve of this patient. The clinical diagnosis was rat-bite fever.

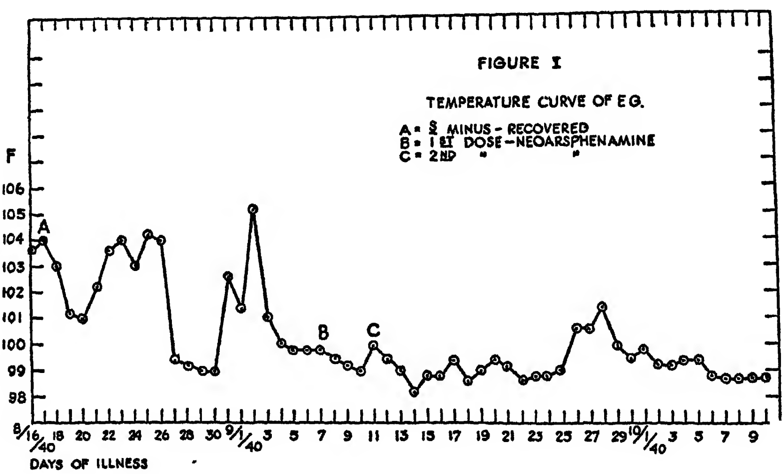
Examinations of the urine failed to reveal anything unusual. On admission blood studies showed hemoglobin 11 gm. per 100 cc., leucocytes 11,000 per cu. mm., and a differential count of 53 percent neutrophiles and 47 percent lymphocytes. On August 31, 1940, there were 7,200 white cells made up of 75 percent neutrophiles and 25 percent lymphocytes, and on September 18, 1940, the leucocytes numbered 6,900. They consisted of 45 percent neutrophiles, 1 percent eosinophiles, and 54 percent lymphocytes. Tuberculin, Schick, and Kahn tests were negative. X-rays failed to reveal evidence of joint damage.

During the early part of the illness, treatment was mainly symptomatic. The local wound was treated conservatively and, with the exception of administration of fluids by clysis, good nursing care was the only treatment employed. When a laboratory diagnosis had

[2] Since this paper was presented, *S. minus* was isolated from another case of rat-bite fever in Washington D. C. (Packchanian, A., and Sweet, L. K.: Rat-bite fever in Washington, D. C. Report of first proved case. Med. Ann. Dist. Columbia, 10: 95 (1941)).

been made, neoarsphenamine was administered. This was given in 0.045 mg. and 0.060 mg. amounts on September 7 and 11, 1940, respectively.

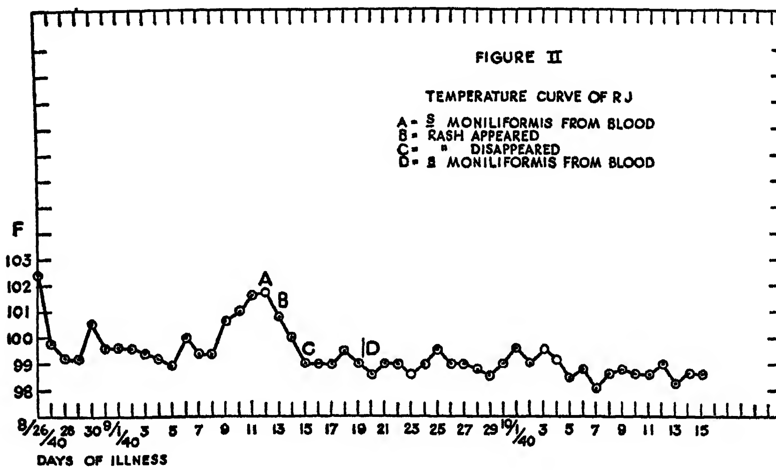
Blood for bacteriological examination was obtained on August 17, 1940. Direct examination using dark-field illumination did not reveal *S. minus*. The blood was injected intraperitoneally into 4 white mice, 2 white rats, and 2 guinea pigs, using 0.25, 1.0, and 3.0 cc., respectively. Blood was also inoculated into veal infusion broth containing 20 percent rabbit serum and incubated at 37° C. No growth resulted. Wet smears of the blood of each of the inoculated animals were observed by dark-field illumination at regular intervals.



Although each animal had been observed seven times before September 7, 1940, no organisms were detected until this date when they were observed in the blood of a single rat. The other rat was found to be infected 3 days later. None of the mice or guinea pigs developed organisms in the blood stream. Blood obtained on September 7, 1940, and subjected to the same procedure as the first sample remained negative. Serum taken on the same date was tested for the presence of antibodies against *Streptobacillus moniliformis* but none were detected. A number of stock rats have been examined in order to determine whether the colony was infected with spirillae. No infected animals were discovered. From our studies, we feel that the infection set up in the two rats injected with the patient's blood was directly due to the injection and that the patient was suffering from rat-bite fever.

Case 2.—R. J., a colored male infant, aged 7 months, was bitten on the right foot by a wild rat on August 26, 1940. He was taken to Children's Hospital on the same day and, as the foot was swollen and a number of puncture wounds were present, the child was admitted to

the service of Dr. Ong. On admission the patient's temperature was 102.6° F. The local wound healed and the child's condition was generally good until September 7, 1940, when he developed diarrhea and vomiting. Two days later a fever of 100.6° F. was noted. The following day, when the temperature was 101° F., the baby appeared very ill, with symptoms of anorexia, vomiting, and diarrhea. Considerable weight loss occurred. Clinically it was considered that this febrile period constituted the onset of rat-bite fever following an incubation period of about 14 days. On September 13, 1940, when the patient was still very ill, having a temperature of 101.6° F., a reddish maculopapular rash was discovered on the hands, arms, and



soles of the feet. The rash disappeared when firm pressure was applied. Two days later the rash had faded considerably, and by September 18, 1940, had become imperceptible and did not again return. During this period the baby was restless and extremely irritable, protesting whenever handled. There was no reaction at the site of inoculation during the febrile period and at no time was evidence of arthritis elicited.

Repeated urinalysis gave no results of note. Blood studies during the course of the illness showed a hemoglobin content ranging from 10 to 11 gm. per 100 cc. and a leucocyte count of 8,700 to 11,700 per cu. mm. The differential was 51–57 percent neutrophiles, 1–3 percent eosinophiles, 0–1 percent monocytes, and 40–45 percent lymphocytes. X-rays of the joints were essentially negative.

Specimens of blood for bacteriological studies were obtained on August 26, September 13, and September 20, 1940. These samples were subjected to the same procedures carried out on those received from the previous case. Although 12 mice, 6 white rats, and 6 guinea pigs were inoculated, *S. minus* was not found in any of the animals.

The first specimen of blood taken on the day of admission was bacteriologically sterile. *S. moniliformis* was obtained from both the other samples which were cultured on veal infusion broth containing 20 percent rabbit serum.

Extreme care was taken with these cultures as the organism may not grow well on original isolation. In the first instance, a few fine white colonies were imbedded in the blood clot which was suspended in the culture medium. They were so unimpressive that they might easily have been overlooked. Subcultures yielded a profuse growth, morphologically resembling *S. moniliformis*. Dr. F. Heilman of the Mayo Clinic concurred in the identification of the culture. The organisms reacted with a specific antiserum to the same titer as did two known strains of *S. moniliformis* kindly sent us by Dr. Heilman.

Case 3.—J. Y., a 21-year-old white male, employed at the National Institute of Health, Washington, D. C., as an animal caretaker, was bitten by a white rat, in the course of his work, on April 19, 1940. The wound bled freely and, after the initial pain, caused him no difficulty. About 10 a. m. on April 22 he complained of chilly sensations and of a severe headache localizing in the occiput and frontal regions. In a short time he became nauseated, vomited, and broke out in profuse perspiration. He vomited several times during the day and night previous to admission to the United States Marine Hospital, Baltimore, Md., on April 23. The patient felt tired, but had difficulty in sleeping. He was admitted to the service of Dr. K. F. Nelson in a toxic condition with a temperature of 38.6° C., pulse rate of 80, and respiratory rate of 16 per minute. There were a few enlarged cervical lymph nodes and the abdomen was tender. The liver was palpable 2 cm. below the costal margin on deep inspiration. It was questionable whether or not the spleen could be felt. The skin and extremities were essentially negative.

Laboratory examination at this time showed the urine to be essentially normal. The blood contained 15.2 gm. hemoglobin per 100 cc., 3,430,000 erythrocytes, and 6,950 leucocytes per cu. mm. The differential count was 16 percent small mononuclears, 4 percent large mononuclears, and 80 percent neutrophiles. Kline and Eagle tests were negative. The blood sedimentation rate was 18 mm. in 1 hour. X-rays of the chest revealed no lesions of significance.

The patient was given symptomatic and supportive treatment and under this therapy the temperature returned to normal on April 25, 1940, and remained so until April 27, when it rose to 38.8° C. He became irrational and developed a definite rash on the wrists, forearms, and ankles. The rash disappeared on pressure. Two days later the patient was subjectively better, the temperature was normal, and the rash had faded in intensity. On May 3 there was an elevation of temperature to 38.4° C. The patient's general condition was good,

but he complained of pain in the right elbow with limitation of movement. This joint was swollen and tender, but not red. He also developed pain in other joints, but this was not intense. The following day he complained of sore throat. The rash had disappeared by that time. The patient felt better on May 7, but was still running a low-grade fever of 37.6° C. Blood studies on this date showed hemoglobin 12.6 gm. per 100 cc., erythrocytes 4,000,000, leucocytes 8,400 with a differential of 33 percent small mononuclears, 1 percent large mononuclears, 3 percent transitional cells, and 63 percent neutrophiles and a sedimentation rate of 25 mm. in 1 hour.

From this time on the patient began a slow and steady convalescence. Pain of increasing and decreasing severity in various joints caused some discomfort. Sore throat of varying intensity also complicated convalescence. He became afebrile on July 1, and remained so for 4 days when he was discharged. At this time the Kline and Eagle tests were positive.

During the course of the illness, agglutination tests of the blood serum by Dr. F. Heilman of the Mayo Clinic and Dr. T. Brown of Johns Hopkins Hospital were carried out. Both reported complete agglutination of *S. moniliformis* at a titer of 1:160 and partial agglutination at 1:320. Two attempts to isolate the organism were unsuccessful. A sample of serum obtained on September 4 agglutinated three strains of *S. moniliformis* to a titer of 1:80. Wassermann and Kahn tests on this serum gave negative results.

This case presented symptoms of intermittent fever, rash, and arthritis. The fact that the wound healed promptly and failed to react during the febrile periods would indicate that *S. minus* was not involved. This, together with the appearance of arthritis, led to a clinical diagnosis of rat-bite fever due to *S. moniliformis* and the laboratory studies bore this out.

Study of the three cases suggests the need for inclusion of methods directly concerned with identification of *S. moniliformis* when considering the laboratory diagnosis of rat-bite fever. Samples of blood should be cultured on veal infusion broth with 20 percent rabbit serum and incubated at 37° C. and serum should be made available for an agglutination test. While the former procedure is simple, the latter one is somewhat difficult for considerable labor is required to procure a suitable stable antigen. We have obtained our antigens by grinding the organisms in a mortar and pestle, or in a ball mill for ½ to 1 hour and suspending the material in normal salt solution containing 0.02 percent formalin. Once a stable emulsion of organisms is prepared, the test is no more formidable than the routine ones commonly employed in most laboratories.

From our cases it is apparent that the clinical diagnosis of rat-bite fever may be rendered difficult by the absence of certain cardinal

features. The absence of a primary chancre at the site of inoculation, failure of a rash to appear, or the presence of an atypical temperature curve may cause hesitation in diagnosis; this can be offset by employing proper laboratory methods for confirmation.

CONCLUSIONS

Three cases of rat-bite fever occurring in Washington, D. C., were diagnosed by isolation of the organism in two instances and by serological evidence in the other. *Spirillum minus* or *Streptobaccillus moniliformis* may be the cause of rat-bite fever in this area.

REFERENCES

(*1*) Robertson, A.: *Spirillum minus*, Carter, 1887, the aetiological agent of rat-bite fever: A review. Ann. Trop. Med. and Parasit., **24**: 367 (1930).
(*2*) Futaki, K., Takaki, I., Taniguchi, T., and Osumi, S.: *Spirocheta morsus muris*, n. sp. The cause of rat-bite fever. 2d paper. J. Exp. Med., **25**: 33 (1917).
(*3*) Carter, H. V.: Note on the occurrence of a minute blood spirillum in an Indian rat. Sci. Mem. Med. Off. Army of India, part 3, p. 45 (1887).
(*4*) Bayne-Jones, S.: Rat-bite fever in the United States. Internat. Clin., **3**: 235 (1931).
(*5*) Shattuck, G. C., and Theiler, M.: Rat-bite disease in the United States with report of a case. Am. J. Trop. Med., **4**: 453 (1924).
(*6*) Francis, E.: Rat-bite fever and relapsing fever in the United States. Trans. Assoc. Am. Phys., **47**: 143 (1932).
(*7*) Leadingham, R. S.: Rat-bite fever (sodoku), report of five cases. Am. J. Clin. Path., **8**: 333 (1938).
(*8*) Lanford, J. A., and Lawson, E. H.: Etiology of rat-bite fever; preliminary report. New Orleans Med. and Surg. J., **77**: 349 (1924–25).
(*9*) Foncannon, F.: Rat-bite fever. Kans. Med. Soc., **31**: 33 (1930).
(*10*) Ripley, H., and Van Sant, H.: Rat-bite fever. J. Am. Med. Assoc., **102**: 1917 (1934).
(*11*) Koerber, G. E.: Rat-bite fever. (Report of case.) Calif. and West. Med., **42**: 31 (1935).
(*12*) Reitzel, R. J., Haim, A., and Prindle, K.: Rat-bite fever. J. Am. Med. Assoc., **106**: 1090 (1936).
(*13*) Wooley, P. V. J.: Rat-bite fever. Report of a case with serological observations. J. Pediat., **8**: 693 (1936).
(*14*) Block, J., and Baldock, H.: Rat-bite fever. J. Pediat., **10**: 358 (1937).
(*15*) Gilkie, H. M., and Dennie, C. C.: Rat-bite fever in children. South. Med. J., **32**: 1109 (1939).
(*16*) Walker, H.: Rat-bite fever. A report of two cases. Va. Med. Monthly, **64**: 272 (1937).
(*17*) Kaneko, R., and Okuda, K.: A contribution to the etiology and pathology of rat-bite fever. J. Exp. Med., **26**: 363 (1917).
(*18*) Francis, E.: Rat-bite fever spirochaetes in naturally infected white mice, *Mus musculus*. Pub. Health Rep., **51**: 976 (1936).
(*19*) Das Gupta, B. M.: Spontaneous infection of guinea pigs with a spirillum, presumably *Spirillum minus*. Carter, 1887. Ind. Med. Gaz., **73**: 140 (1938).
(*20*) Blake, F. G.: The etiology of rat-bite fever. J. Exp. Med., **23**: 39 (1916).
(*21*) Tunnicliff, R.: Streptothrix in bronchopneumonia of rats similar to that in rat-bite fever. J. Infect. Dis., **19**: 767 (1916).
(*22*) Tunnicliff, R.: Streptothrix in bronchopneumonia of rats similar to that in rat-bite fever. J. Am. Med. Assoc., **66**: 1606 (1916).
(*23*) Strangeways, W. L.: Rats as carriers of *Streptobacillus moniliformis*. J. Path. and Bact., **37**: 45 (1933).
(*24*) Tileston, W.: The etiology and treatment of rat-bite fever. J. Am. Med. Assoc., **66**: 995 (1916).
(*25*) Dawson, M. H., and Hobby, G. L.: Rat-bite fever. Trans. Assoc. Am. Phys., **54**: 329 (1939).

(26) Place, E. H., and Sutton, L. E.: Erythema arthriticum epidemicum (Haverhill fever). Arch. Int. Med., **54**: 659 (1934).
(27) Parker, F., and Hudson, N. P.: The etiology of Haverhill fever (erythema arthriticum epidemicum). Am. J. Path., **2**: 357 (1926).
(28) Allbritten, F. F., Sheely, R. F., and Jeffers, W. A.: *Haverhillia multiformis* septicemia; its etiologic and clinical relationship to Haverhill and rat-bite fevers. J. Am. Med. Assoc., **114**: 2360 (1940).

DEATHS DURING WEEK ENDED SEPTEMBER 20, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Sept. 20, 1941	Correspond ing week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,264	7,069
Average for 3 prior years	7,563	
Total deaths, first 38 weeks of year	321,301	322,202
Deaths per 1,000 population, first 38 weeks of year, annual rate	11.8	11.8
Deaths under 1 year of age	503	520
Average for 3 prior years	506	
Deaths under 1 year of age, first 38 weeks of year	19,941	19,056
Data from industrial insurance companies:		
Policies in force	64,464,670	64,843,013
Number of death claims	11,023	11,227
Death claims per 1,000 policies in force, annual rate	8.9	9.1
Death claims per 1,000 policies, first 38 weeks of year, annual rate	9.6	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED SEPTEMBER 27, 1941

Summary

A slight decrease was reported in the incidence of poliomyelitis for the country as a whole—592 cases as compared with 596 for the preceding week and 595 for the next earlier week. The East North Central and West South Central areas recorded slight increases, while five geographic areas decreased and two (Middle and South Atlantic) reported the same numbers of cases as last week. The following named 12 States reported 15 or more cases (last week's figures in parentheses): New York, 115 (113)—New York City, 42 (52), State exclusive of New York City, 73 (61); Pennsylvania, 66 (70); Ohio, 42 (34); Tennessee, 39 (24); Alabama, 35 (57); Illinois, 31 (25); New Jersey, 29 (27); Michigan, 26 (20); Georgia, 17 (22); Minnesota, 16 (24); Massachusetts, 15 (20); Maryland, 15 (24). Indiana dropped out of this group during the current week.

For the corresponding week, 711 cases were reported in 1940 and 603 in 1937, in both of which years the peak was reached in the 37th week (second week of September). This year the peak appears to have been reached during the 35th week (last week in August). To date this year (first 39 weeks), 6,393 cases of poliomyelitis have been reported, as compared with 7,724 in 1937 and 6,363 in 1940 for the corresponding period.

The incidence of infectious encephalitis declined in all western States in the area of recent epidemic prevalence.

The number of reported cases of influenza continues higher than the 5-year (1936–40) median and is above that for any corresponding week during the past 5 years. Of 830 cases reported for the current week 310 cases (37 percent) occurred in Texas.

Only 1 case of smallpox was reported (in Michigan). A total of 1,214 cases has been reported to date this year as compared with 2,020 for the corresponding period in 1940, in which year the incidence was the lowest on record.

Four cases of Rocky Mountain spotted fever were reported, 3 in Virginia and 1 in North Carolina. Three cases of tularemia were reported in Utah. Of 93 cases of endemic typhus fever, 36 occurred in Georgia, 27 in Texas, and 9 in Alabama.

The crude death rate for the current week for 88 large cities in the United States is 10.3 per 1,000 population, as compared with 10.1 for the preceding week and a 3-year (1938–40) average of 10.7 for the corresponding week. The accumulative rate to date is 11.8, the same as for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended September 27, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940	
NEW ENG.												
Maine	0	1	1	-------	2	1	18	1	4	1	1	1
New Hampshire	0	0	0	-------	-------	-------	1	0	0	0	0	0
Vermont	0	0	0	-------	-------	-------	3	2	5	0	0	0
Massachusetts	2	2	3	-------	-------	-------	53	64	25	1	1	1
Rhode Island	3	0	0	-------	-------	-------	1	0	0	0	1	0
Connecticut	2	0	1	-------	1	1	8	2	4	1	0	0
MID. ATL.												
New York	6	14	14	-------	[1] 8	[1] 8	48	51	51	5	4	4
New Jersey	1	3	5	3	1	5	27	49	16	1	0	0
Pennsylvania	12	10	16	2	-------	-------	67	82	46	2	4	3
E. NO. CEN.												
Ohio	8	6	27	5	6	6	22	8	20	0	0	1
Indiana	9	8	10	11	4	10	3	5	3	0	0	0
Illinois	8	11	14	3	3	6	18	32	22	0	1	1
Michigan [2]	5	4	11	-------	5	2	38	55	15	0	1	1
Wisconsin	0	2	2	27	33	33	23	70	28	0	0	0
W. NO. CEN.												
Minnesota	2	1	4	2	-------	1	8	4	6	0	0	0
Iowa	0	2	5	-------	-------	-------	6	2	3	0	1	0
Missouri	20	3	4	-------	1	11	3	3	3	1	0	0
North Dakota	2	3	3	-------	-------	5	11	4	2	0	0	0
South Dakota	13	1	1	-------	1	-------	1	0	2	1	0	0
Nebraska	1	1	3	-------	-------	-------	4	19	2	0	1	0
Kansas	1	6	6	1	2	2	8	5	5	0	1	0
SO. ATL.												
Delaware	1	0	0	-------	-------	-------	2	2	1	0	0	0
Maryland [2]	4	8	6	2	-------	3	7	1	3	0	2	3
Dist. of Col.	0	2	2	-------	-------	-------	3	2	3	0	0	0
Virginia [3] [4]	16	10	39	41	40	32	28	16	6	3	0	1
West Virginia [2] [5]	0	2	14	-------	7	7	23	2	2	0	1	1
North Carolina [4]	69	46	105	-------	2	2	41	11	11	0	0	0
South Carolina [3]	44	8	23	185	147	147	18	0	0	3	0	0
Georgia [3]	38	18	38	20	11	5	19	11	1	1	0	0
Florida [3]	6	5	10	16	8	3	2	1	1	1	1	1
E. SO. CEN.												
Kentucky	12	14	24	-------	2	3	11	33	12	0	0	2
Tennessee [3]	19	10	34	7	5	13	20	5	4	0	2	1
Alabama [3]	40	16	39	4	2	7	7	16	6	0	1	1
Mississippi [2] [3]	11	10	19	-------	-------	-------	0	-------	-------	0	0	0
W. SO. CEN.												
Arkansas	21	12	20	17	16	5	18	1	1	1	0	0
Louisiana [3]	6	2	14	12	-------	3	0	2	1	1	2	1
Oklahoma	12	9	7	17	11	12	31	1	1	0	0	0
Texas [2] [3]	33	34	34	310	71	71	21	6	13	0	2	2
MOUNTAIN												
Montana	7	0	0	8	-------	-------	14	16	16	0	0	0
Idaho	0	0	0	-------	-------	2	2	1	1	0	0	0
Wyoming	0	0	0	4	-------	-------	0	0	3	0	0	0
Colorado	4	4	5	55	-------	-------	9	6	7	1	0	0
New Mexico	0	3	3	-------	-------	-------	6	1	3	1	0	0
Arizona	1	0	2	36	43	18	29	11	3	0	0	0
Utah [2]	0	0	0	-------	2	2	2	5	2	0	0	0
Nevada	0	-------	-------	-------	-------	-------	0	-------	-------	0	-------	-------
PACIFIC												
Washington	0	4	3	12	-------	-------	4	6	7	0	0	0
Oregon	0	3	3	16	15	11	15	7	8	0	0	0
California [3]	12	14	15	14	19	16	75	47	47	0	1	1
Total	451	307	609	830	468	525	778	668	668	25	28	28
39 weeks [5]	9, 581	10, 350	16, 979	603, 973	172, 013	154, 152	835, 423	232, 468	272, 221	1, 600	1, 319	2, 337

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 27, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940		Sept. 27, 1941	Sept. 28, 1940	
NEW ENG.												
Maine	5	1	1	6	0	4	0	0	0	0	0	2
New Hampshire	0	0	0	1	1	3	0	0	0	0	0	0
Vermont	0	0	0	2	4	4	0	0	0	1	0	0
Massachusetts	15	7	4	68	28	40	0	0	0	1	0	2
Rhode Island	1	0	0	2	3	3	0	0	0	0	0	0
Connecticut	12	1	3	13	17	17	0	0	0	2	0	2
MID. ATL.												
New York	115	21	21	[1] 93	[1] 92	[1] 125	0	0	0	31	16	25
New Jersey	29	3	3	31	38	38	0	0	0	9	5	10
Pennsylvania	66	13	13	53	95	110	0	0	0	16	20	20
E. NO. CEN.												
Ohio	42	46	27	81	93	106	0	0	0	12	12	24
Indiana	10	44	7	7	22	68	0	0	0	2	7	8
Illinois	31	65	65	65	104	107	0	2	1	13	21	20
Michigan [2]	26	72	44	55	62	88	1	1	1	4	5	5
Wisconsin	8	40	8	52	61	68	0	0	0	2	1	2
W. NO. CEN.												
Minnesota	16	25	25	20	38	37	0	1	1	0	4	4
Iowa	0	101	16	26	18	25	0	0	2	0	6	3
Missouri	4	28	2	19	16	25	0	0	0	20	14	14
North Dakota	0	0	0	1	10	10	0	3	3	0	0	1
South Dakota	2	8	1	4	11	8	0	0	0	0	0	2
Nebraska	8	7	3	12	3	12	0	0	0	0	1	1
Kansas	2	45	4	44	28	56	0	0	0	3	5	5
SO. ATL.												
Delaware	4	0	0	10	2	2	0	0	0	0	1	1
Maryland [3]	15	1	2	23	17	17	0	0	0	17	8	8
Dist. of Col.	3	1	1	6	11	6	0	0	0	4	1	1
Virginia [3, 4]	8	24	3	25	18	23	0	0	0	18	15	19
West Virginia [2, 3]	4	64	2	45	20	35	0	0	0	17	19	15
North Carolina [4]	10	2	2	46	81	81	0	0	0	9	6	10
South Carolina [3]	11	0	0	18	6	8	0	0	0	14	8	14
Georgia [3]	17	0	1	26	27	23	0	0	0	4	17	14
Florida [3]	9	2	0	7	2	2	0	0	0	4	4	4
E. SO. CEN.												
Kentucky	6	13	2	47	35	52	0	0	0	14	15	24
Tennessee [3]	39	4	4	43	60	44	0	0	0	12	14	11
Alabama [3]	35	0	1	27	26	26	0	0	1	10	17	6
Mississippi [2, 3]	3	1	1	9	14	13	0	0	0	6	3	7
W. SO. CEN.												
Arkansas	1	1	1	1	11	11	0	0	0	4	18	16
Louisiana [3]	4	12	1	1	10	5	0	0	0	5	25	22
Oklahoma	2	8	3	12	18	14	0	0	0	4	12	12
Texas [2, 3]	5	3	3	14	20	24	0	0	1	22	48	34
MOUNTAIN												
Montana	0	6	1	7	20	20	0	0	0	1	0	3
Idaho	1	6	1	7	10	9	0	0	0	2	5	4
Wyoming	0	6	1	1	1	3	0	0	0	0	2	1
Colorado	1	0	9	21	11	18	0	0	1	0	1	10
New Mexico	0	2	2	1	0	4	0	1	0	6	6	10
Arizona	0	0	0	1	2	2	0	0	0	0	1	1
Utah [3]	3	0	0	3	4	7	0	0	0	1	1	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	4	15	5	21	18	18	0	0	2	4	2	4
Oregon	5	0	3	6	10	10	0	0	1	7	8	4
California [3]	10	13	18	59	72	93	0	1	1	7	9	12
Total	592	711	469	1,142	1,270	1,487	1	9	20	308	383	428
39 weeks [5]	6,393	6,303	4,899	96,661	124,176	144,157	1,214	2,020	8,284	6,472	7,441	10,440

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended September 27, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended Sept. 27, 1941	Whooping cough, Week ended Sept. 28, 1940
NEW ENG.		
Maine	35	6
New Hampshire	2	0
Vermont	7	9
Massachusetts	109	104
Rhode Island	33	2
Connecticut	31	49
MID. ATL.		
New York	343	224
New Jersey	159	118
Pennsylvania	173	353
E. NO. CEN.		
Ohio	269	160
Indiana	19	21
Illinois	185	111
Michigan [2]	319	243
Wisconsin	265	110
W. NO. CEN.		
Minnesota	70	38
Iowa	21	3
Missouri	18	25
North Dakota	33	26
South Dakota	14	2
Nebraska	24	4
Kansas	50	41
SO. ATL.		
Delaware	3	15
Maryland [2]	36	65
Dist. of Col	24	2
Virginia [3 4]	45	48
West Virginia [2 5]	25	37
North Carolina [4]	103	99
SO. ATL.—continued		
South Carolina [3]	94	18
Georgia [3]	10	10
Florida [3]	24	5
E. SO. CEN.		
Kentucky	79	79
Tennessee [3]	20	37
Alabama [3]	14	27
Mississippi [2 3]	-------	-------
W. SO. CEN.		
Arkansas	20	6
Louisiana [3]	7	3
Oklahoma	14	14
Texas [2 3]	93	117
MOUNTAIN		
Montana	3	3
Idaho	6	2
Wyoming	6	1
Colorado	62	13
New Mexico	24	18
Arizona	13	12
Utah [2]	19	20
Nevada	1	-------
PACIFIC		
Washington	50	36
Oregon	19	6
California [3]	202	269
Total	3,195	2,611
39 weeks [5]	165,957	122,903

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Sept. 27, 1941, 93 cases as follows: Virginia, 1; South Carolina, 5; Georgia, 36; Florida, 4; Tennessee, 1; Alabama, 9; Mississippi, 3; Louisiana, 5; Texas, 27; California, 2.
[4] Rocky Mountain spotted fever, week ended Sept. 27, 1941, 4 cases as follows: Virginia, 3; North Carolina, 1.
[5] Figures for West Virginia are for the current week instead of a week earlier as has been the case previously. Figures for the week ended Sept. 20 are as follows: Diphtheria, 4; measles, 9; poliomyelitis, 2; scarlet fever, 24; typhoid fever, 9; whooping cough, 24.

WEEKLY REPORTS FROM CITIES

City reports for week ended September 13, 1941

This table lists the reports from 133 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	0	1	0	0	0	1	21
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	6
Manchester	0	------	0	0	1	4	0	0	0	0	26
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	1	2	10	0	11	0	26	180
Fall River	3	------	0	2	1	2	0	0	0	10	25
Springfield	0	------	0	1	0	4	0	0	2	7	32
Worcester	0	------	0	2	2	2	0	0	0	18	31
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	0	14
Providence	0	------	0	9	0	3	0	1	0	43	55
Connecticut:											
Bridgeport	0	------	0	1	2	4	0	0	0	5	26
Hartford	0	------	0	0	2	2	0	0	0	0	38
New Haven	0	------	0	2	1	0	0	0	0	13	44
New York:											
Buffalo	0	------	0	1	6	5	0	5	0	8	106
New York	6	------	1	18	23	30	0	58	21	194	1,211
Rochester	0	------	1	0	2	0	0	1	0	3	48
Syracuse	0	------	0	2	2	0	0	0	0	27	47
New Jersey:											
Camden	0	------	0	1	0	1	0	1	0	3	37
Newark	0	1	0	2	0	9	0	5	0	72	82
Trenton	0	------	0	0	1	1	0	1	2	1	32
Pennsylvania:											
Philadelphia	1	2	0	3	15	7	0	21	3	45	415
Pittsburgh	0	------	0	2	10	3	0	2	0	34	145
Reading	0	------	0	0	0	0	0	0	0	2	23
Scranton	0	------	------	0	------	0	0	------	0	2	------
Ohio:											
Cincinnati	0	------	0	1	2	12	0	13	0	6	116
Cleveland	1	6	0	1	6	7	0	7	0	60	170
Columbus	0	------	0	2	2	4	0	1	0	4	73
Toledo	0	------	0	0	4	2	0	5	1	24	74
Indiana:											
Anderson	0	------	0	0	1	0	0	1	0	0	3
Fort Wayne	0	------	0	0	1	1	0	1	0	0	25
Indianapolis	0	------	0	0	6	2	0	1	0	3	80
Muncie	0	------	0	0	0	0	0	0	0	2	9
South Bend	0	------	0	1	0	0	0	0	0	0	13
Illinois:											
Alton	0	------	0	0	1	0	0	0	0	0	6
Chicago	6	1	0	4	7	17	0	23	1	120	546
Elgin	0	------	0	0	2	0	0	0	0	2	6
Moline	0	------	0	0	0	0	0	0	0	2	16
Springfield	0	------	0	0	4	0	0	0	0	0	19
Michigan:											
Detroit	1	------	0	3	8	18	0	7	0	105	216
Flint	0	------	0	0	3	0	0	0	0	0	21
Grand Rapids	0	------	0	1	0	1	0	0	0	10	35
Wisconsin:											
Kenosha	0	------	0	0	0	0	0	0	0	0	4
Milwaukee	0	------	0	7	0	0	0	3	0	107	93
Racine	0	------	0	2	0	1	0	0	0	6	7
Superior	0	------	0	1	0	1	0	0	0	10	12
Minnesota:											
Duluth	0	------	0	0	0	0	0	1	0	5	24
Minneapolis	0	------	1	2	0	1	0	3	0	11	102
St. Paul	1	------	0	0	2	3	0	0	0	14	50
Iowa:											
Cedar Rapids	0	------	------	1	------	0	0	------	0	0	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	0	------	0	0	0	2	0	0	0	0	34
Sioux City	0	------	------	0	------	1	0	------	0	2	------
Waterloo	0	------	------	1	------	1	0	------	0	2	------

City reports for week ended September 13, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0	------	0	1	3	1	0	4	0	4	83
St. Joseph	0	------	0	0	0	0	0	0	0	0	18
St. Louis	0	------	0	2	8	1	0	5	1	13	172
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	1	3
Grand Forks	0	------	------	0	------	0	0	------	0	1	------
Minot	0	------	0	0	0	1	0	0	0	0	10
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	4	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	8
Nebraska:											
Lincoln	0	------	------	1	------	3	0	------	0	1	------
Omaha	0	------	0	1	1	0	0	0	0	3	41
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	6	10
Topeka	0	------	0	0	0	2	0	0	0	8	8
Wichita	0	------	0	1	2	0	0	0	0	2	13
Delaware:											
Wilmington	0	------	0	0	0	5	0	0	0	1	23
Maryland:											
Baltimore	0	1	0	6	9	5	0	8	1	31	218
Cumberland	0	------	0	0	0	0	0	0	0	0	9
Frederick	0	------	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	1	------	0	0	6	11	0	10	0	24	152
Virginia:											
Lynchburg	1	------	0	0	0	0	0	0	0	0	9
Norfolk	0	------	0	0	0	0	0	0	1	2	34
Richmond	0	------	0	2	2	1	0	0	1	0	51
Roanoke	0	------	0	0	0	0	0	0	1	0	19
West Virginia:											
Charleston	0	------	0	0	1	0	0	0	0	0	23
Huntington	0	------	------	0	------	0	0	------	1	0	------
Wheeling	0	------	0	0	2	0	0	1	0	2	15
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	1	------	0	0	0	0	0	0	0	8	6
Wilmington	0	------	0	0	1	1	0	0	0	16	14
Winston-Salem	1	------	0	0	2	0	0	1	1	0	19
South Carolina:											
Charleston	0	1	0	0	0	0	0	0	0	0	17
Florence	0	------	------	0	------	0	0	------	0	0	------
Greenville	1	------	0	0	0	1	0	0	0	0	11
Georgia:											
Atlanta	1	------	0	1	0	0	1	4	0	0	62
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	1	------	0	0	1	1	0	0	0	0	22
Florida:											
Miami	0	2	0	1	0	0	0	1	0	0	34
Tampa	0	------	0	0	1	0	0	0	0	1	25
Kentucky:											
Ashland	0	------	0	1	1	1	0	0	1	1	9
Covington	0	------	0	0	1	1	0	0	0	0	12
Lexington	0	------	0	0	0	1	0	1	0	1	11
Louisville	1	------	0	2	4	2	0	2	1	18	66
Tennessee:											
Knoxville	0	------	0	0	0	0	0	0	0	0	15
Memphis	0	------	0	0	1	2	0	4	0	6	90
Nashville	0	------	0	0	4	0	0	4	0	11	42
Alabama:											
Birmingham	0	1	0	1	1	2	0	2	3	6	51
Mobile	0	------	1	0	0	0	0	2	0	0	29
Montgomery	1	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	0	2	0	0	1	0	0	1	0	0	22
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	2	11
New Orleans	3	3	2	0	8	1	0	15	5	0	155
Shreveport	0	------	0	0	0	1	0	2	3	1	36
Oklahoma:											
Oklahoma City	0	------	0	0	3	0	0	1	0	0	50
Tulsa	0	------	0	0	1	0	0	1	1	2	16

City reports for week ended September 13, 1941—Continued

State and city	Diphtheria cases	Influenza: Cases	Influenza: Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Texas:											
Dallas	5	------	0	3	1	1	0	1	1	1	66
Fort Worth	0	------	0	0	2	1	0	0	2	1	27
Galveston	0	------	0	0	0	0	0	0	0	0	13
Houston	3	------	0	0	7	1	0	3	1	0	95
San Antonio	1	1	0	0	2	2	0	3	0	4	68
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	14
Great Falls	0	------	0	1	1	0	0	0	0	0	8
Helena	0	------	0	0	0	0	0	0	0	2	4
Missoula	0	------	0	0	2	1	0	0	0	5	8
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	6
Colorado:											
Colorado Springs	0	------	0	0	0	2	0	0	1	3	6
Denver	7	9	0	1	2	1	0	3	0	41	83
Pueblo	0	------	0	0	1	2	0	0	0	7	11
New Mexico:											
Albuquerque	0	------	0	0	0	0	0	2	0	0	14
Arizona:											
Phoenix	0	11	--------	0	-------	1	0	-------	0	2	--------
Utah:											
Salt Lake City	0	------	0	1	0	1	0	0	0	8	31
Washington:											
Seattle	0	------	0	0	2	1	0	2	0	26	100
Spokane	0	------	0	0	2	5	0	0	1	2	27
Tacoma	0	------	0	0	2	0	0	1	0	4	29
Oregon:											
Portland	1	------	0	1	0	0	0	2	0	2	77
Salem	0	------	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	6	5	0	6	2	4	0	12	0	32	367
Sacramento	1	------	0	0	4	0	0	2	0	1	29
San Francisco	1	1	0	2	6	4	0	3	0	8	158

State and city	Meningitis, meningococcus: Cases	Meningitis, meningococcus: Deaths	Poliomyelitis cases
New Hampshire:			
Nashua	0	0	1
Massachusetts:			
Boston	0	0	7
Springfield	0	0	1
Connecticut:			
Bridgeport	0	0	3
New York:			
Buffalo	0	0	4
New York	2	0	53
Rochester	0	0	6
Syracuse	0	0	2
New Jersey:			
Camden	0	0	1
Newark	1	1	3
Pennsylvania:			
Philadelphia	1	0	15
Pittsburgh	0	0	1
Scranton	0	0	2
Ohio:			
Cleveland	0	0	19
Illinois:			
Chicago	0	0	12
Elgin	0	0	1
Michigan:			
Detroit	0	0	10
Grand Rapids	0	0	3
Minnesota:			
Duluth	0	0	5
Minneapolis	0	0	7
St. Paul	0	0	8
Maryland:			
Baltimore	0	0	5
District of Columbia:			
Washington	0	0	3
Virginia:			
Norfolk	0	0	1
Richmond	0	0	1
North Carolina:			
Gastonia	0	0	1
Georgia:			
Atlanta	0	0	2
Kentucky:			
Lexington	0	0	1
Louisville	0	0	5
Tennessee:			
Knoxville	0	0	1
Nashville	0	0	5
Alabama:			
Birmingham	1	0	2
Montgomery	0	0	1
Texas:			
Houston	0	0	1
Montana:			
Billings	0	0	1
Colorado:			
Colorado Springs	0	0	1
Utah:			
Salt Lake City	0	0	1
Washington:			
Seattle	0	0	3
Oregon:			
Portland	0	0	1
California:			
Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: Rochester, 1; Duluth, 1; Minneapolis, 1; St. Paul, 2; Cedar Rapids, 2; Sioux City, 2; Omaha, 1; Billings, 1. Deaths: Portland, Me., 1; New York, 2; Newark, 1; Cedar Rapids, 1; Fargo, 1; Mobile, 1; Great Falls, 1.

Pellagra.—Cases: Atlanta, 1; Savannah, 3; Montgomery, 1.

Typhus fever.—Cases: New York, 1; Charleston, S. C., 1; Atlanta, 1; Brunswick, 1; Savannah, 2; Miami, 1; New Orleans, 6; Dallas, 2; Houston, 4. Deaths: Nashville, 1.

Rates (annual basis) per 100,000 population for a group of 88 selected cities (population, 1940, 33,855,510)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid-fever cases	Whooping-cough cases
Week ended Sept. 13, 1941	8.0	5.2	0.9	15.7	30.5	32.2	0.2	39.9	7.4	192.8
Average for week, 1936–40	12.3	6.1	1.9	23.2	43.0	45.8	0.3	49.8	10.4	169.1

PLAGUE INFECTION IN FLEAS AND GROUND SQUIRRELS IN SAN BERNARDINO AND SISKIYOU COUNTIES, CALIF.

Under date of September 17, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved in a pool of 21 fleas and in a pool of approximately 500 lice, all from 1 golden mantled ground squirrel submitted to the laboratory on August 20 from San Bernardino National Forest, 1 mile south of the Osito Girls' Camp, San Bernardino County, Calif.

Under the same date Dr. Brown also reported plague infection proved in fleas and ground squirrels submitted to the laboratory from Siskiyou County on August 21 and 22, as follows: In the carcass of 1 squirrel, species unknown, found on a ranch 4 miles east and 1 mile north of Yreka; in 1 ground squirrel, *C. douglasii*, and in a pool of 187 fleas from 9 ground squirrels of the same species taken from property 2 miles north and 2½ miles west of Mount Shasta City; and in another pool of 189 fleas from 5 ground squirrels, *C. douglasii*, from a location ½ mile north of Mount Shasta City.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended August 23, 1941.—During the week ended August 23, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Bruns-wick	Que-bec	On-tario	Mani-toba	Sas-katch-ewan	Al-berta	British Colum-bia	Total
Cerebrospinal meningitis	2			1	1	2	1	2	3	12
Chickenpox		7		7	24		9	9	7	63
Diphtheria		2	1	21	3	2			2	31
Dysentery				38						38
Influenza		1			4	5			1	11
Lethargic encephalitis						184	[1] 147	1	1	333
Measles			1	106	97	5	9	6	63	287
Mumps				29	23	7	10	5	5	79
Pneumonia		2			5				5	12
Poliomyelitis		1	56	2	12	120	8	12	5	216
Scarlet fever		4	1	64	54	5	7	3	9	147
Trachoma									1	1
Tuberculosis	8		12	9	42	8		1		70
Typhoid and paratyphoid fever			6	24	3			5	3	41
Whooping cough			6	174	100	7		1	23	311

[1] Encephalomyelitis.

DENMARK

Notifiable diseases—April–June 1941.—During the months of April, May, and June 1941, cases of certain notifiable diseases were reported in Denmark, as follows:

Disease	April	May	June	Disease	April	May	June
Cerebrospinal meningitis	29	23	11	Mumps	376	384	403
Chickenpox	1,650	1,647	1,454	Paratyphoid fever		12	6
Diphtheria	57	26	41	Poliomyelitis	2	3	
Dysentery	24	25	83	Puerperal fever	17	20	10
Epidemic encephalitis	4	2	4	Scarlet fever	472	534	467
Erysipelas	212	174	207	Syphilis	41	42	13
Gastroenteritis, infectious	2,248	2,400	2,646	Tetanus, neonatorum	5	3	1
German measles	5,242	6,020	4,293	Typhoid fever	2	2	
Gonorrhea	541	619	717	Undulant fever	44	39	49
Influenza	22,174	7,696	3,297	Weil's disease	1		1
Measles	3,862	4,313	5,160	Whooping cough	2,487	2,790	3,006

SWEDEN

Notifiable diseases—June 1941.—During the month of June 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	10	Poliomyelitis	17
Diphtheria	5	Scarlet fever	1,249
Dysentery	3	Syphilis	17
Gonorrhea	695	Typhoid fever	1
Paratyphoid fever	4	Undulant fever	6

SWITZERLAND

Communicable diseases—May 1941.—During the month of May 1941, cases of certain communicable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	23	Paratyphoid fever	3
Chickenpox	121	Poliomyelitis	5
Diphtheria and croup	99	Scarlet fever	270
Dysentery	2	Trachoma	1
German measles	311	Tuberculosis	316
Influenza	2	Typhoid fever	7
Measles	388	Undulant fever	9
Mumps	71	Whooping cough	216

×

Public Health Reports

VOLUME 56 **OCTOBER 10, 1941** NUMBER 41

IN THIS ISSUE

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

CONTENTS

Public Health Reports

Vol. 56 • OCTOBER 10, 1941 • *No. 41*

DOCTORS' CALLS IN CONNECTION WITH ILLNESS FROM SPECIFIC DISEASES AMONG 9,000 FAMILIES, BASED ON NATION-WIDE PERIODIC CANVASSES, 1928–31 [1]

By SELWYN D. COLLINS, *Principal Statistician, United States Public Health Service*

CONTENTS

Illnesses from a given disease have many different characteristics. Clinically they are described in terms of symptoms and lesions present. Epidemiologically they are described in terms of mass phenomena such as geographic spread, seasonal and other chronological variation, and incidence by age and sex, in urban as compared with rural areas, and among the poor as compared with the rich. Somewhere between these two types of characteristics of illnesses lie such descriptive items as average duration of symptoms, of inability to work, and of tim in bed on account of sickness. Somewhat similar measures are the number of doctors' calls per case of illness from a given disease, the distribution of illnesses according to the number of calls, and the percentage of cases that were attended by different types of practitioners. It is true that these latter characteristics of illnesses are somewhat artificial in the sense that the number of calls for a given case of sickness may depend as much upon ability to pay as upon the severity of the case; however, the number of days in bed and the time lost from work also frequently depend to a considerable degree upon how many days' wages the patient can afford to lose or how much time is allowed him

[1] From Statistical Investigations, Division of Public Health Methods, National Institute of Health.

This is the seventeenth of a series of papers on sickness and medical care in this group of families (*1–16*). The survey of these families was organized and conducted by the Committee on the Costs of Medical Care; the tabulation was done under a cooperative arrangement between the Committee and the Public Health Service. Committee publications based on the results deal primarily with costs and Public Health Service publications primarily with the incidence of illness and the extent and kind of medical care, without regard to cost. As costs are meaningless without some knowledge of the extent and nature of the service received, there is inevitably some overlapping. The Committee staff, particularly Dr. I. S. Falk and Miss Margaret Klem, cooperated in the tabulation of the data.

Special thanks are due to Dr. Mary Gover, who assisted in the analysis, to Mrs. Lily Vanree Welch, who was in immediate charge of tabulating the data, and to other members of the statistical staff of the Public Health Service for advice and assistance in the preparation of the study.

as sick leave. The comparison of different diagnoses with respect to the amount of medical care actually received in connection with a case of illness would seem of interest; such data are the subject of this paper.

I. SOURCE AND CHARACTER OF DATA

In the study of illness in a group of families in 18 States [2] that was made by the Committee on the Costs of Medical Care (*17*) and the United States Public Health Service, the record for each illness included all service received from physicians and other practitioners within the 12-month study period. Among the items recorded were type of attendant and the number of home, office, and clinic calls. Thus doctors' calls per case of illness can be computed. A preceding paper (*16*) was devoted to doctors' calls per 1,000 population.

The composition and characteristics of the group of 8,758 white families which were kept under observation for 12 consecutive months in the years 1928–31 have been considered in some detail in the first report in the series (*1*). These families, including a total of 39,185 individuals, resided in 130 localities in 18 States representing all geographic sections. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas.[3] With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Each family was visited at intervals of 2 to 4 months for a period long enough to obtain a sickness record for 12 consecutive months. On the first call a record was made of the number of members of the household, together with sex, age, marital status, occupation, and other facts about each person. On succeeding visits the canvasser recorded all illness that had occurred since the preceding call, with such pertinent facts about each case as the date of onset; whether attended and the type of each attendant in such terms as private physician, surgeon or other specialist, clinic physician, dentist, chiropodist, osteopath, chiropractor, midwife, or other; number of calls on the case by each practitioner, with separation of physicians' calls into home and office. Data about cases that were still sick at the preceding visit were brought up to date and when completed the termination was entered. Thus there are available certain facts about the attendant for each illness and the number of doctors' services received.

---

[2] The 18 States sampled and the number of canvassed families were as follows: California (890), Colorado (386), Connecticut (100), District of Columbia (99), Georgia (544), Illinois (463), Indiana (494), Kansas (301), Massachusetts (287), Michigan (329), Minnesota (224), New York (1,710), Ohio (1,148), Tennessee (212), Virginia (412), Washington (551), West Virginia (318), Wisconsin (290). Further details about the distribution of the canvassed population are included in a preceding paper (*1*).

[3] Every community that was included in the study had either a local health department or some other organization employing a visiting nurse or both; therefore, the most rural areas with no organized community services are not represented.

Definition of illness as recorded in survey.—An illness, for the purpose of this study, was defined as any symptom, disorder, or affection which persisted for one or more days or for which medical service[4] was received or medicine purchased. Illness included the results of both disease and injury. What was actually included as illness, however, was necessarily influenced not only by the informant's (usually the housewife's) conception of sickness but also by her memory. With visits as infrequent as 2 to 4 months, it was inevitable that many of the unattended nondisabling illnesses would be terminated and forgotten before the next visit of the enumerator. The relatively few but long institutional cases which are largely missed in family surveys[5] would add little to a study of home and office calls by doctors in a noninstitutional population. It is felt, therefore, that doctors' services as recorded in this study are reasonably complete for the general family population.

Definition of doctors' care[6] *as recorded in survey.*—An illness was considered as attended[7] if any type of practitioner was called in or consulted about the case, including all hospital cases; the analysis, however, considers attendants of different types. Illnesses with two or more diagnoses were counted as attended if a doctor was called in connection with any diagnosis. Nursing services are tabulated separately; nurses are not included in this analysis of attendants who had primary responsibility for cases, even in the few instances where a nurse was the only attendant.[8] However, a midwife who was the

---

[4] Exclusive of dental services, eye refractions, immunizations, and health examinations rendered when no symptoms were present.

[5] The limitations of the house-to-house survey in recording institutional cases were discussed in considerable detail in an earlier paper in this series (*14*). No special inquiry was made in this study about mental defectives at home or about persons away from the family throughout the year in such resident institutions as hospitals for the insane, mentally defective, or tuberculous; however, a few such cases were recorded. Physical impairments such as blindness and lost and impaired limbs were not included as sickness unless the defect was treated or otherwise involved some status other than the mere presence of an impairment.

[6] To avoid the repeated use of a long expression such as "all types of practitioners," "doctor" is used in this study in the popular sense to designate any type of healer; and "physician" and "specialist" are used to designate persons with medical degrees. For the most part percentages are shown separately for the different types of healers.

Also the reference made in many places to calls *made by* some practitioner is understood to include those in which the patient went to the doctor (office) as well as those in which the doctor went to the patient (home or hospital).

[7] In a few instances the only consultation was by telephone or by some other member of the family going to see the doctor; such cases were counted among the total attended by some practitioner but no calls were counted for them. By reason of tabulating methods, attended cases for specific types of practitioners do not include those cases in which the doctor did not see the patient. The numbers of such cases are small, amounting for specialists to about 0.6 percent of the specialists' cases, and for general medical practitioners to less than 2 percent of the cases, chiefly for communicable, minor respiratory, and minor digestive diseases.

If a doctor treated two or more patients on one call to a family, each patient seen was counted as having a call. See footnotes to table 1 for further details.

[8] There were 168 cases not counted as attended in which a visiting or other nurse or medical assistant was the only attendant, 0.7 percent of the 25,569 cases tabulated as attended by some practitioner. Of these 168 cases, 80 were communicable diseases, 32 minor respiratory diseases, 21 skin diseases, 11 accidental injuries, and the remainder scattered in various groups.

There were 40 cases not counted as attended which were said to have been seen by a health officer, presumably for diagnosis or quarantine only, 0.2 percent of the total cases tabulated as attended. Thirty-five of these cases were communicable diseases and four were poison ivy or rash that was presumably suspected of being some communicable disease.

only attendant is counted as a primary attendant because she customarily has charge of a case without the supervision of a physician. Thus the attendant refers to anyone who assumes primary charge of a case; the quality of service is disregarded because no index of quality was available. However, in some of the tables the services of medical doctors (M. D.) are separated from other types of attendants; cases attended only by the hospital or clinic staff are counted in this group of medically attended cases.

Classification of causes of illness.—In the present study of 8,758 households by periodic visits, the diagnoses as reported by family informants were submitted to the attending physician for confirmation or correction and his diagnosis substituted for the one reported by the family. While not all cases were attended and reports could not be obtained from all attending physicians, the replies indicated that the housewife usually reported with reasonable accuracy the diagnosis which the physician had given to the family.[9]

Considering an illness in the sense of a continuous period of sickness, only 4.3 percent were designated as due to more than one cause. In general, the more important or more serious cause was assigned as primary, except where a disease like pneumonia is commonly recognized as following measles or influenza, in which case the antecedent condition was taken as primary.[10] In this series of papers, averages and rates for illness from all causes and from broad disease groups are based on sole or primary diagnoses only. Case rates per 1,000 population for specific diseases such as pneumonia, appendicitis, and whooping cough are based on all cases of the given diagnosis whether it was the sole, primary, or contributory cause of the illness; average calls per case are usually shown separately for cases with sole diagnosis and for complicated cases.

Methods of tabulating and computing.—In computing calls per case, illnesses that originated prior to but caused sickness during the study year are included along with cases having their onset within the period of observation; the inclusion of the illnesses with prior onset seems necessary to give proper representation to chronic ailments. The only date of onset available was the onset of symptoms (nondisabling or disabling); therefore, prior onset does not necessarily mean prior attendance by a doctor. Seven percent of the attacks of illness had their onset prior to the study year; this does not mean that in the other 93 percent the disease always had its onset within the year, for the patient may have had preceding attacks of the same chronic disease. For all diagnoses commonly considered as chronic, 33 percent were

[9] See comparison of diagnoses reported by families and by physicians in the Health Survey of 1935-36 (*19*, table 2).

[10] Further details on the method of classifying the causes of illness are included in the first report in the series (*1*).

reported with an onset for this illness prior to the study year, as compared with 3 percent for diagnoses ordinarily considered acute. A large proportion of the cases of such diseases as tuberculosis, cancer, diabetes, and cardio-renal affections originated prior to the study.[11]

Doctors' calls refer in all instances to those *within the 12-month study period.* In computing average calls per case, both complete and incomplete cases are included as cases but the calls refer to those within the study year only. The incomplete cases (those with prior onset and those still sick at the last report) usually average considerably longer durations and presumably have more doctors' calls than the complete cases; therefore, average calls per case which excluded those with prior onset would be biased toward fewer calls. Attended cases with an unknown number of calls are put in at the average calls per case of the same diagnosis attended by the same type of practitioner.

In the present paper no distinction is made between hospital and nonhospital cases, the average calls per case referring always to all cases. Only 7 percent of all cases and 10 percent of attended cases were hospitalized; and of those hospitalized only 5 percent did not receive home, office, or hospital calls from a private doctor or clinic physician in addition to care by the hospital staff.[12] A later paper will be devoted to hospital care.

II. MEAN CALLS PER CASE AND THE PROPORTION OF CASES AND CALLS BY DIFFEKENT TYPES OF PRACTITIONERS

Table 1 shows for illnesses classified into 13 broad diagnosis groups the average number of calls per case, and the proportion of cases attended by and of calls made by different types of practitioners. The final column shows for cases attended by physicians not designated as specialists the proportion that had one or more home calls. Table 2 shows similar data for specific diseases with enough cases to justify the computation of averages and percentages, including all diagnoses with 10 or more attended cases with known numbers of calls. Both tables show data separately for illnesses of sole diagnosis and for those designated as "complicated," in which the given diagnosis was one of two or more recorded for the illness.

[11] A preceding paper (*15*) shows the percentage of cases of different types that were incomplete because of prior onset or because still sick at the last report on the case; the first report (*1*) in the series shows by specific disease the number of cases with onset prior to the study year.

[12] Home, office, and hospital calls by private or clinic doctors for hospitalized illness amounted to 8 7 call per case, as compared with 4.2 calls per case for all attended illnesses. Doctors' calls per hospitalized cas for the specific diagnoses were in nearly every instance larger than the corresponding figure for all attende cases; thus the greater severity of the cases that were hospitalized led to more doctors' calls per case in add tion to supplementary care by the hospital staff.

The diagnoses with a high percentage of cases with no care except by the hospital staff were tuberculosis, 16 percent; nervous diseases, 16 percent; bones, joints, malformations, and diseases of early infancy, 15 percent; communicable diseases, 9 percent; and accidents, 9 percent No other frequent hospital diagnoses were over 6 percent.

TABLE 1.—*Mean calls by any practitioner within the year of observation*[1] *per case of illness from broad groups*[2] *of causes, and the proportion of cases and calls for different types of practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Disease and whether sole diagnosis or complicated by another disease[3]	Attended cases per 1,000 population (adjusted)[4]	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner[5]: Per total case	Mean calls by any practitioner[5]: Per attended case	Percent of attended cases[6] attended by—: Any physician or clinic (all M. D.)[7]	Percent of attended cases[6] attended by—: Specialist[8]	Percent of attended cases[6] attended by—: Public clinic	Percent of attended cases[6] attended by—: Nonmedical practitioner[9]	Percent of calls[6] by—: Specialist[8]	Percent of calls[6] by—: Public clinic	Percent of calls[6] by—: Nonmedical practitioner[9]	Percent of general physician's cases[10] with home calls
All causes:													
Sole or primary	646.6	25,569	78.1	3.3	4.2	95.6	12.8	4.8	4.3	14.3	4.7	8.7	57.1
Sole	-------	24,290	77.5	3.1	3.9	95.4	12.2	4.7	4.3	13.9	4.7	8.8	56.5
Complicated	-------	2,673	90.9	8.5	9.3	98.2	24.8	6.1	3.7	17.3	4.6	6.8	69.5
Minor respiratory diseases (11, pt. 97, 98, 99, pt. 107, pt. 109):													
Sole or primary	176.3	7,283	64.2	1.6	2.4	98.2	7.8	2.2	2.3	9.4	2.1	2.8	68.9
Sole	-------	6,869	63.4	1.4	2.2	98.1	6.9	2.2	2.3	8.4	1.8	3.0	68.7
Complicated	-------	516	83.5	4.4	5.3	99.0	21.8	3.3	2.1	14.9	3.3	1.3	74.2
Other respiratory diseases (31, pt. 97, 100–106, pt. 107, pt. 109):													
Sole or primary	48.2	1,991	95.2	5.5	5.8	97.8	36.8	10.9	1.7	29.2	6.3	2.5	53.1
Sole	-------	1,881	95.0	5.2	5.4	97.8	36.4	10.6	1.7	28.8	6.4	2.6	51.9
Complicated	-------	270	98.5	12.0	12.1	99.3	40.0	11.9	1.9	26.2	4.5	1.3	78.7
Minor digestive diseases (15, pt. 16, 112–114):													
Sole or primary	43.1	1,772	76.3	1.8	2.4	98.8	6.4	3.2	1.7	10.0	3.1	7.5	55.2
Sole	-------	1,710	75.9	1.7	2.3	98.9	6.4	3.2	1.6	10.4	3.1	6.3	55.5
Complicated	-------	146	79.3	4.2	5.3	95.2	7.5	3.4	5.5	7.2	2.0	14.1	51.9

[1] Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but only for calls of the respective kinds that came within the year of observation. Average calls per case tend to be greater for incomplete than for complete cases because the longer the case the greater the probability that it will be still sick at the last visit. Prior onset of illness does not necessarily mean that medical attention was received prior to the study year.

[2] The specific diagnoses in each group are shown in table 2 and figures 1 and 2.

[3] A case is considered as complicated if another diagnosis is reported as occurring simultaneously with or as overlapping the period of sickness from the diagnosis listed regardless of which diagnosis was classified as the primary cause of the illness. The complication may have a definite relationship to the other diagnosis (as in measles and pneumonia), or be apparently unrelated (as in measles and chickenpox). The numbers in parentheses following the names of the diseases are those used in the International List of Causes of Death, 1920 revision.

[4] Adjusted by the direct method to the age distribution of the white population of the death registration States in 1930 as a standard population; this population is given for specific ages in table 1 of a preceding paper (4). The adjustment method involves the weighting of the age specific rates for the canvassed population according to the age distribution of the standard population. The details of the process are given under the heading of "corrected death rates" in Pearl (18) pp. 260–271.

[5] In computing mean calls per case and the percentage of calls by different types of practitioners, cases attended by a given type of practitioner but with an unknown number of calls were put in at an average based on cases of the same diagnosis. Attended cases include some hospital cases with no calls because all service was rendered within the hospital by the hospital staff. A few attended cases had all calls prior to the study year (0.4 percent were so reported). Doctors' calls were entered and coded in actual numbers up to 99 and in class intervals of 10 above that number; means were computed from summated calls and not from the distribution of cases in the broader class intervals shown in table 4.

[6] Because two or more types of practitioners may attend the same case, these percentages for *cases* do not necessarily add to 100; also cases and calls by dentists are not included in any practitioner group except the total. The percent of *calls* (home, office, and clinic) by physicians (all M. D.) is not shown but the approximate percent can be computed by subtracting the percent of calls by nonmedical practitioners from 100. The result would include estimated calls *on illness* by dentists which are negligible (less than 1.0 percent) for all the diagnosis groups except "other respiratory," sole or primary 1.8 percent, sole 2.0; "all other diseases," sole or primary 2.9, sole 2.9 percent.

[7] M. D. includes private physician, surgeon or other specialist, private group clinic, public clinic, outpatient department, and hospital.

[8] Specialist means a physician so designated by the family informant; a negligible percentage of these cases and calls represent specialists in clinics and are counted in both categories.

[9] Nonmedical practitioners include osteopath, chiropractor, Christian Scientist or other faith healer, midwife, naturopath, and other nonmedical practitioners, and also supplementary practitioners such as chiropodist, physiotherapist, and optician, but not dentist.

[10] General physician means private physician (M. D.) not designated as specialist.

TABLE 1.—*Mean calls by any practitioner within the year of observation*[1] *per case of illness from broad groups of causes, and the proportion of cases and calls for different types of practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of calls by—: Specialist	Percent of calls by—: Public clinic	Percent of calls by—: Nonmedical practitioner	Percent of general physician's cases with home calls
Other digestive diseases (pt. 108, 110, 111, 115–127):													
Sole or primary	26.4	945	91.7	6.1	6.7	97.6	22.8	2.6	4.1	28.0	1.9	9.3	54.7
Sole	-------	859	91.0	5.6	6.1	97.3	21.7	2.2	4.3	29.0	1.5	9.3	54.7
Complicated	-------	155	96.9	10.7	11.0	98.7	35.5	5.8	2.6	25.6	3.0	8.3	55.5
Communicable diseases (1–10, 12–14, pt. 16, 17–30, 32–42):													
Sole or primary	49.5	2,496	68.0	2.5	3.6	99.8	5.7	3.4	.6	5.7	6.8	.7	78.8
Sole	-------	2,370	67.0	2.3	3.5	99.8	5.1	3.2	.6	4.9	6.9	.7	78.2
Complicated	-------	179	94.2	7.0	7.4	99.4	17.9	8.4	2.2	13.5	7.3	2.3	90.0
Ear and mastoid diseases (86):													
Sole or primary	15.3	676	93.5	4.1	4.4	99.4	43.2	7.0	1.0	41.1	6.6	3.3	49.8
Sole	-------	648	93.2	3.9	4.2	99.5	42.9	6.8	.8	43.6	6.1	1.1	49.1
Complicated	-------	197	92.9	6.5	7.0	99.5	43.7	6.6	1.0	24.6	7.6	4.6	77.4
Nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis (70–73, 76–81, 84):													
Sole or primary	13.1	465	93.2	5.0	5.4	90.8	8.8	5.6	11.6	7.1	8.5	20.8	50.7
Sole	-------	445	93.1	4.9	5.3	90.3	8.3	5.4	12.1	6.3	8.9	22.1	49.7
Complicated	-------	71	91.0	9.4	10.3	98.6	18.3	2.8	5.6	20.1	.4	4.5	73.8
Rheumatism and related diseases (51, 52, 82, pt. 158):													
Sole or primary	22.2	699	87.7	4.9	5.6	86.0	5.6	3.7	19.3	5.2	3.8	30.0	50.4
Sole	-------	673	87.5	4.7	5.3	85.6	5.1	3.7	19.8	3.6	4.1	32.1	49.7
Complicated	-------	93	87.7	9.5	10.8	93.5	15.1	4.3	10.8	20.9	2.5	20.3	58.4
Degenerative diseases (43–50, 57, 74, 75, 83, 87–92, pt. 93, pt. 96, 128–130, pt. 131, 132, pt. 133, 135):													
Sole or primary	40.9	1,161	95.3	7.7	8.1	98.0	14.8	4.0	5.1	10.6	3.9	8.2	48.4
Sole	-------	973	95.4	6.7	7.0	98.2	13.9	3.8	4.2	11.2	3.4	6.4	43.5
Complicated	-------	389	94.9	12.7	13.4	98.2	19.8	4.1	6.7	8.8	3.6	9.1	73.8
Skin diseases (151–154, pt. 205):													
Sole or primary	28.4	1,146	85.5	3.4	3.9	96.7	12.4	4.7	4.4	14.5	4.3	6.1	21.9
Sole	-------	1,134	85.3	3.3	3.9	96.6	12.3	4.4	4.4	14.7	3.9	6.3	21.8
Complicated	-------	64	97.0	7.5	7.8	98.4	25.0	17.2	6.3	14.7	11.6	2.7	54.5
Female genital and puerperal diagnoses (137–150):													
Sole or primary	[11] 79.6	1,491	96.8	7.4	7.7	97.2	12.5	8.4	4.0	11.0	5.9	4.8	66.7
Sole	-------	1.397	96.7	6.9	7.2	97.1	11.2	8.5	4.0	9.4	6.3	4.3	66.6
Complicated	-------	192	97.5	15.2	15.5	99.5	33.3	6.8	3.6	23.8	2.4	8.4	66.9
Accidental injuries (pt. 85, 165–203):													
Sole or primary	66.0	2,595	90.1	3.8	4.3	96.8	7.8	6.9	4.1	7.7	5.0	6.4	39.1
Sole	-------	2,553	90.0	3.8	4.2	96.8	7.6	6.9	4.2	7.3	5.2	6.6	38.7
Complicated	-------	51	98.1	9.6	9.8	98.0	21.6	5.9	2.0	16.4	1.2	.2	63.0
All other diseases (53–56, 58–69, 85, pt. 93, 94, 95, pt. 96, pt. 108, pt. 131, pt. 133, 134, 136, 155–157, pt. 158, 159–164, 204, 205):													
Sole or primary	73.8	2,849	86.3	3.9	4.5	79.7	15.2	6.2	14.5	17.6	5.5	23.8	38.5
Sole	-------	2,778	86.2	3.8	4.4	79.3	15.2	6.2	14.8	17.6	5.5	24.2	38.3
Complicated	-------	350	88.6	7.0	7.8	96.6	18.9	6.6	4.6	14.1	10.4	8.5	56.1

[11] The rate for female genital and puerperal diagnoses is expressed as cases per 1,000 *females;* the rate per 1,000 total population is 43.4.

TABLE 2.—*Mean calls by any practitioner within the year of observation*[1] *per case of illness from specific*[2] *causes, and the proportion of cases and calls for different types of practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Disease and whether sole diagnosis or complicated by another disease[3]	Attended cases per 1,000 population (adjusted)[4]	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner[5]: Per total case	Mean calls by any practitioner[5]: Per attended case	Percent of attended cases[6] attended by—: Any physician or clinic (all M. D.)[7]	Percent of attended cases[6] attended by—: Specialist[8]	Percent of attended cases[6] attended by—: Public clinic	Percent of attended cases[6] attended by—: Nonmedical practitioner[9]	Percent of calls[6] by—: Specialist[8]	Percent of calls[6] by—: Public clinic	Percent of calls[6] by—: Nonmedical practitioner[9]	Percent of general physician's cases[10] with home calls
Minor respiratory diseases:													
Influenza and grippe (11)	65.17	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	2,418	76.7	1.97	2.56	98.4	4.3	0.9	2.0	3.6	0.6	2.5	84.1
Complicated	----	156	92.9	6.41	6.90	99.4	17.9	3.2	2.6	9.7	2.8	1.7	84.9
Bronchitis and chest colds (99)	82.07	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	1,257	69.8	1.67	2.39	98.7	6.1	5.6	1.4	5.5	5.0	2.1	66.0
Complicated	----	66	80.5	4.70	5.83	100.0	10.6	1.5	1.5	23.4	1.3	.5	74.2
Coryza and colds, unqualified (pt. 97, pt. 107)	47.72	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	1,796	46.0	.75	1.62	96.2	7.0	1.8	4.0	8.7	1.6	6.5	49.4
Complicated	----	174	76.3	2.48	3.25	98.9	22.4	1.7	1.7	17.3	.7	.5	66.9
Cough (pt. 107)	1.24	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	54	54.0	.89	1.65	100.0	5.6	1.9	----	11.2	4.5	----	43.2
Tonsillitis (pt. 109)	16.69	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	677	80.5	1.61	2.00	99.4	8.4	1.5	1.0	11.0	1.3	1.3	72.7
Complicated	----	54	96.4	4.66	4.83	100.0	25.9	3.7	----	20.3	1.5	----	82.6
Quinsy (pt. 109)	1.85	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	62	93.9	3.76	4.00	98.4	21.0	----	3.2	17.7	----	4.8	79.6
Sore throat (pt. 109)	8.75	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	325	52.3	1.26	2.41	100.0	13.2	3.1	----	26.7	2.2	----	52.8
Complicated	----	19	54.3	3.06	5.63	100.0	31.6	----	----	23.4	----	----	70.6
Other pharynx and tonsil affections, except tonsillectomy (pt. 109)	3.82	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	127	92.0	3.61	3.92	99.2	20.5	3.1	2.4	31.5	1.0	1.0	66.7
Complicated	----	34	97.1	5.37	5.53	94.1	41.2	14.7	5.9	17.0	22.9	1.1	58.3
Laryngitis (pt. 98)	2.69	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	94	90.4	2.47	2.73	95.7	22.3	2.1	6.4	30.3	1.2	8.9	61.8
Croup (pt. 98)	1.11	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	63	57.3	.94	1.63	100.0	4.8	----	----	3.9	----	----	87.0
Other respiratory diseases:													
Tonsillectomy and adenoidectomy (pt. 109)	17.97	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	791	100.0	2.76	2.76	99.5	51.7	12.6	.5	47.9	8.6	1.0	33.0
Complicated	----	50	100.0	8.04	8.04	100.0	46.0	12.0	----	28.6	3.5	----	55.3
Pneumonia, all forms (100, 101)	7.29	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	238	99.6	9.59	9.63	99.2	7.6	1.7	1.3	4.3	.6	.8	96.0
Complicated	----	77	100.0	14.90	14.90	100.0	33.8	5.2	1.3	18.1	1.5	.8	97.0
Sinusitis (pt. 97)	10.38	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	324	95.3	6.04	6.31	96.9	51.9	4.9	3.7	53.5	3.6	5.5	34.8
Complicated	----	54	98.2	12.25	12.48	98.1	57.4	7.4	1.9	48.8	3.7	1.5	62.2
Vincent's angina (pt. 109)	1.11	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	38	100.0	14.47	14.47	65.8	13.2	----	----	3.1	----	----	33.3
Asthma (105)	3.44	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	104	79.4	4.02	5.06	98.1	11.5	4.8	3.8	12.2	3.0	5.3	60.2
Complicated	----	19	100.0	10.89	10.89	94.7	15.8	10.5	10.5	15.9	5.8	10.6	82.4
Hay fever (pt. 107)	1.51	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	55	73.3	5.87	8.00	90.9	14.5	5.5	9.1	6.1	9.5	12.5	17.5

For notes 1, 3, 5, 7, 8, 9, and 10, see notes with same numbers on table 1.

[2] The table shows data for all diagnoses that had 10 or more cases attended by a doctor with known numbers of calls. Within this limitation, the diagnoses are the same as shown in table 2 of a preceding paper on durations (*15*).

[4] These rates per 1,000 population are for sole, primary, and contributory causes occurring during the year, as defined in notes 1 and 5 to table 1; the age adjustment for attended cases is approximate only and is obtained by applying the percentage of cases that were attended to the age adjusted rate for all cases (attended and not attended) as shown for the same diagnoses in table 2 of a preceding paper (*15*).

[6] Because two or more types of practitioners may attend the same case, these percentages for cases do not necessarily add to 100; also cases and calls by dentists are not included in any practitioner group except the total. The percent of calls (home, office, and clinic) by physicians (all M. D.) is not shown but the approximate percentages can be computed by subtracting the percent of calls by nonmedical practitioners from 100. The result would include estimated calls on illness by dentists which is negligible (less than 1.0 percent) for all diagnoses except Vincent's angina, sole diagnosis 38.2 percent; diseases of the mouth except teeth and gums, sole 2.7, complicated 6.7; rheumatism (unqualified), sole 1.1; neuralgia and neuritis, sole 1.4, complicated 2.1; diseases of the lymphatic system, complicated 1.4; diseases of the teeth and gums, sole 56.9, complicated 14.5; debility and fatigue, complicated 1.1 percent.

TABLE 2.—*Mean calls by any practitioner within the year of observation per case of illness from specific causes, and the proportion of cases and calls for different types or practitioners 8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31* —Continued.

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of calls by—: Specialist	Percent of calls by—: Public clinic	Percent of calls by—: Nonmedical practitioner	Percent of general physician's cases with home calls
Other respiratory diseases—Con.													
Pleurisy (102)	3.21	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	77	90.6	2.91	3.21	98.7	6.5	1.3	----	4.0	.4	----	65.7
Complicated	----	28	96.6	8.52	8.82	100.0	25.0	3.6	3.6	4.0	1.2	----	95.8
Respiratory tuberculosis (pt. 31)	2.83	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	89	96.7	10.01	10.35	98.9	11.2	49.4	1.1	19.3	21.8	1.3	74.4
Complicated	----	13	100.0	21.00	21.00	100.0	38.5	53.8	----	22.7	14.7	----	55.6
Suspected respiratory tuberculosis (pt. 31)	1.14	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	38	97.4	8.90	9.13	100.0	10.5	47.4	----	29.7	26.8	----	36.4
Minor digestive diseases:													
Indigestion, upset stomach, and nausea (pt. 112)	23.89	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	880	77.5	1.47	1.89	99.0	3.9	3.3	1.0	6.2	3.1	2.2	53.0
Complicated	----	65	71.4	3.13	4.38	96.9	1.5	3.1	3.1	1.1	.7	2.8	54.1
Biliousness (pt. 112)	2.55	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	92	66.7	1.25	1.88	100.0	----	1.1	2.2	----	1.2	26.0	55.7
Other and ill-defined stomach diseases (pt. 112)	5.16	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	171	82.2	2.96	3.60	96.5	17.0	2.9	4.1	23.6	3.7	9.1	35.3
Complicated	----	26	86.7	3.80	4.38	84.6	7.7	----	19.2	15.8	----	35.1	35.0
Diarrhea and enteritis (15, pt. 16, 113, 114)	14.08	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	568	73.5	1.90	2.59	99.3	8.1	3.3	1.6	11.4	3.1	7.3	65.3
Complicated	----	49	87.5	6.25	7.14	98.0	16.3	6.1	2.0	6.9	3.7	17.1	64.3
Other digestive diseases:													
Ulcers of stomach and duodenum (111)	2.21	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	68	97.1	9.10	9.37	97.1	14.7	8.8	10.3	7.5	6.3	19.5	33.3
Intestinal parasites, except hookworm (116)	.64	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	33	80.5	1.27	1.58	100.0	6.1	----	----	5.8	----	----	31.0
Appendicitis (117)	9.40	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	284	97.6	6.61	6.77	98.2	32.0	1.1	2.8	39.6	.4	4.0	67.8
Complicated	----	60	98.4	12.43	12.63	100.0	48.3	5.0	1.7	24.0	.9	9.5	65.4
Hernia, intestinal obstruction (118)	2.82	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	79	88.8	5.89	6.63	98.7	29.1	5.1	2.5	24.2	3.8	1.9	42.6
Complicated	----	17	100.0	7.94	7.94	100.0	41.2	11.8	----	19.3	7.4	----	56.3
Constipation (pt. 119)	1.73	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	54	65.9	2.35	3.57	90.7	5.6	1.9	13.0	7.3	1.6	26.4	32.6
Biliary calculi, cholecystitis (123, pt. 124)	5.74	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	152	93.8	6.71	7.15	98.0	17.8	1.3	3.9	25.4	.4	15.5	69.5
Complicated	----	22	95.7	9.91	10.36	100.0	31.8	4.5	4.5	17.5	9.6	11.0	61.1
Other and ill-defined liver diseases (pt. 124)	1.99	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	55	84.6	2.66	3.15	92.7	3.6	1.8	9.1	4.6	.6	23.7	38.3
Complicated	----	14	100.0	7.21	7.21	92.9	----	----	14.3	----	----	44.6	46.2
Diseases of the mouth except teeth and gums (pt. 108)	1.26	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	53	96.4	2.04	2.11	98.1	13.2	----	----	17.0	----	----	34.8
Communicable diseases:													
Measles (7)	11.11	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	568	64.0	1.17	1.83	100.0	4.2	----	----	4.7	----	----	96.0
Complicated	----	50	94.3	3.92	4.16	100.0	12.0	8.0	----	19.2	12.0	----	95.5
German measles (pt. 25)	.61	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	25	43.1	.66	1.52	100.0	4.0	----	----	2.6	----	----	76.2
Whooping cough (9)	9.30	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	506	71.5	2.32	3.25	100.0	6.3	4.5	1.0	6.4	5.0	.6	68.5
Complicated	----	28	90.3	6.32	7.00	100.0	7.9	7.1	3.6	16.3	1.0	3.1	96.0
Chickenpox (pt. 25)	5.31	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	280	48.4	.73	1.51	100.0	3.9	.7	----	4.7	.7	----	83.8
Complicated	----	17	94.4	4.50	4.76	100.0	5.9	----	----	1.2	----	----	88.2
Mumps (13)	4.25	----	----	----	----	----	----	----	----	----	----	----	----
Sole	----	195	43.7	.71	1.63	99.5	3.1	1.0	1.0	7.2	.6	1.8	79.1
Complicated	----	16	80.0	2.45	3.06	100.0	12.5	----	6.3	4.1	----	12.2	93.3

TABLE 2.—*Mean calls by any practitioner within the year of observation per case of illness from specific causes, and the proportion of cases and calls for different types or practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued.

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of call by—: Specialist	Percent of call by—: Public clinic	Percent of call by—: Nonmedical practitioner	Percent of general physician's cases with home calls
Communicable diseases—Con.													
Scarlet fever (8)	4.18												
Sole		200	93.0	4.95	5.33	100.0	20.0	----	5.0	2.3	----	.3	100.0
Complicated		15	100.0	14.20	14.20	100.0	26.7	----	----	13.1	----	----	100.0
Diphtheria (10)	1.45												
Sole		68	100.0	5.96	5.96	100.0	2.9	1.5	----	3.2	.2	----	100.0
Smallpox (6)	.38												
Sole		16	94.1	5.12	5.44	100.0	----	----	----	----	----	----	100.0
Typhoid fever (1)	.37												
Sole		14	100.0	20.07	20.07	100.0	21.4	----	----	3.9	----	----	92.3
Malaria (5)	2.72												
Sole		95	80.5	3.26	4.05	100.0	2.1	----	----	2.1	----	----	67.4
Complicated		11	100.0	5.91	5.91	100.0	----	----	----	----	----	----	90.9
Erysipelas (21)	.83												
Sole		24	96.0	11.04	11.50	100.0	12.5	----	----	1.1	----	----	77.3
Tuberculosis, nonrespiratory (32–37)	.63												
Sole		21	91.3	9.22	10.10	100.0	47.6	28.6	----	29.7	17.9	----	64.3
Local and other infections not specified as accidental (41)	5.45												
Sole		198	90.4	3.97	4.39	98.0	5.1	1.0	2.5	4.0	.2	3.7	38.3
Complicated		14	100.0	8.86	8.86	100.0	35.7	7.1	14.3	16.1	6.5	14.5	70.0
Smallpox vaccination (pt. 42)	1.58												
Sole		76	100.0	2.16	2.16	100.0	----	30.3	----	----	31.1	---	32.7
Ear and mastoid diseases:													
Earache (pt. 86)	2.45												
Sole		87	75.7	1.26	1.67	98.9	28.7	2.3	1.1	37.2	2.1	.7	42.6
Complicated		30	76.9	2.38	3.10	100.0	20.0	3.3	----	15.1	1.1	----	65.2
Otitis media (pt. 86)	10.19												
Sole		376	96.4	3.82	3.96	100.0	38.8	9.3	.8	37.5	8.1	1.1	55.6
Complicated		126	98.4	7.69	7.81	99.2	46.8	7.9	1.6	21.7	7.4	6.5	85.0
Other ear diseases (pt. 86)	4.76												
Sole		145	96.7	3.74	3.87	98.6	53.8	3.4	.7	61.3	1.6	2.1	20.6
Complicated		29	87.9	4.33	4.93	100.0	41.4	----	----	36.4	----	----	68.2
Diseases of mastoid process (pt. 86)	1.14												
Sole		40	100.0	11.00	11.00	100.0	72.5	5.0	----	59.8	5.0	----	75.0
Complicated		12	100.0	14.25	14.25	100.0	75.0	16.7	----	36.8	17.5	----	100.0
Nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis:													
Nervousness (pt. 84)	6.80												
Sole		203	92.3	3.70	4.00	84.2	5.4	3.9	16.7	4.2	5.3	23.2	32.7
Complicated		26	89.7	7.34	8.19	96.2	11.5	----	11.5	3.8	----	9.9	54.2
Neurasthenia, nervous breakdown (pt. 84)	3.79												
Sole		103	100.0	6.94	6.94	95.1	5.8	1.0	9.7	3.4	5.0	16.1	58.5
Complicated		15	100.0	11.33	11.33	100.0	6.7	----	6.7	7.1	----	7.1	71.4
Convulsions, unqualified (79, 80)	.77												
Sole		36	90.0	2.63	2.92	100.0	8.3	5.6	----	8.6	2.9	----	87.5
Other nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis (70–73, 76–78, 81, pt. 84)	3.33												
Sole		103	89.6	6.10	6.81	94.2	16.5	12.6	9.7	9.4	17.0	30.5	60.0
Complicated		22	84.6	11.81	13.95	100.0	36.4	13.6	----	31.9	1.3	----	89.5
Rheumatism and related diseases:													
Acute rheumatic fever (51)	1.00												
Sole		29	90.6	8.09	8.93	96.6	10.3	3.4	20.7	4.2	.8	27.0	80.8
Chronic rheumatism and arthritis (pt. 52)	5.23												
Sole		114	80.9	9.19	11.37	87.7	14.0	6.1	20.2	6.3	4.3	34.0	54.2
Complicated		29	93.5	15.42	16.48	93.1	20.7	6.9	13.8	24.7	4.8	23.4	60.0
Rheumatism, unqualified (pt. 52)	6.54												
Sole		187	91.7	8.49	3.80	91.4	2.1	5.9	11.8	1.1	9.6	14.9	49.7
Complicated		23	92.0	5.28	5.74	100.0	13.0	4.3	----	18.6	.8	----	47.6

Table 2.—*Mean calls by any practitioner within the year of observation per case of illness from specific causes, and the proportion of cases and calls for different types or practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued.

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of calls by: Specialist	Percent of calls by: Public clinic	Percent of calls by: Nonmedical practitioner	Percent of general physician's cases with home calls
Rheumatism and related diseases—Continued													
Neuralgia and neuritis (82)	7.52												
Sole		205	87.2	4.47	5.12	85.4	3.9	2.9	19.5	1.6	2.1	37.1	44.9
Complicated		29	85.3	8.41	9.86	89.7	10.3	----	17.2	8.7	----	32.5	56.0
Lumbago (pt. 158)	3.58												
Sole		106	86.9	2.35	2.71	83.0	.9	----	22.6	.3	----	34.8	47.1
Myalgia and myositis (pt. 158)	1.02												
Sole		32	91.4	3.20	3.50	43.8	6.3	----	56.3	1.8	----	75.9	38.5
Degenerative diseases:													
Cancer, all sites (43–49)	2.11												
Sole		42	100.0	19.29	19.29	97.6	50.0	11.9	7.1	15.9	11.9	2.8	73.5
Benign tumors, except of female organs (50)	3.84												
Sole		113	99.1	4.38	4.42	97.3	31.9	7.1	3.5	21.2	3.2	1.2	16.1
Complicated		13	100.0	7.77	7.77	100.0	38.5	----	----	23.8	----	----	20.0
Diabetes (57)	2.35												
Sole		53	93.0	9.05	9.74	100.0	15.1	11.3	1.9	9.1	3.3	1.7	46.5
Complicated		14	93.3	11.47	12.29	100.0	42.9	7.1	14.3	20.9	5.8	9.9	72.7
Diseases of the heart (87–90)	11.72												
Sole		190	92.7	6.92	7.46	99.5	6.8	3.2	2.6	5.8	1.9	3.6	56.0
Complicated		123	93.9	13.19	14.05	97.6	16.3	5.7	8.9	4.5	1.9	13.8	78.3
Arteriosclerosis and high blood pressure (pt. 91, pt. 96)	8.07												
Sole		110	99.1	7.54	7.61	99.1	1.8	1.8	3.6	.4	1.1	10.9	49.0
Complicated		74	100.0	15.20	15.20	97.3	17.6	5.4	8.1	4.6	1.6	10.5	77.6
Cerebral hemorrhage and paralysis (74, 75)	2.53												
Sole		27	81.8	12.79	15.63	96.3	14.8	----	18.5	2.6	----	23.5	70.8
Complicated		32	100.0	14.25	14.25	96.9	12.5	----	6.3	4.6	----	7.2	93.1
Varicose veins or ulcer (pt. 93)	1.76												
Sole		41	93.2	6.00	6.44	95.1	7.3	4.9	4.9	8.3	15.2	16.3	23.5
Nephritis, acute and chronic (128, 129)	2.99												
Sole		46	97.9	7.40	7.57	100.0	6.5	2.2	4.3	19.0	1.1	4.3	52.3
Complicated		33	100.0	15.55	15.55	100.0	15.2	3.0	3.0	1.2	.8	2.3	83.3
Other and unspecified kidney diseases except pyelitis (pt. 131)	4.87												
Sole		130	92.9	4.99	5.38	95.4	12.3	1.5	6.2	7.2	.9	10.3	37.4
Complicated		35	79.5	5.32	6.69	97.1	14.3	---	5.7	13.2	----	20.5	58.6
Cystitis, and calculi of urinary passages (132, pt. 133)	4.87												
Sole		131	97.8	4.38	4.48	100.0	13.7	----	2.3	19.6	----	1.5	43.6
Complicated		24	100.0	13.29	13.29	100.0	25.0	----	4.2	19.1	----	1.3	50.0
Other diseases of bladder (pt. 133)	1.88												
Sole		61	95.3	2.83	2.97	95.1	8.2	4.9	6.6	12.2	8.8	11.6	21.2
Skin diseases:													
Furuncle (152)	6.58												
Sole		240	78.2	3.28	4.20	100.0	3.3	2.5	----	10.0	1.6	----	22.2
Complicated		12	100.0	7.58	7.58	100.0	25.0	8.3	16.7	16.5	3.3	12.1	54.5
Abscesses and ulcers (153, pt. 154)	3.22												
Sole		112	96.6	4.03	4.17	100.0	7.1	1.8	----	5.4	1.9	----	40.2
Complicated		11	100.0	5.64	5.64	100.0	36.4	9.1	----	17.7	12.9	----	66.7
Impetigo (pt. 154)	2.28												
Sole		110	79.7	2.30	2.88	100.0	9.1	6.4	----	6.0	4.7	----	15.8
Urticaria, hives (pt. 154)	1.50												
Sole		56	90.3	2.44	2.70	98.2	10.7	1.8	5.4	10.6	.7	21.9	41.3
Scabies (pt. 154)	1.72												
Sole		74	69.8	1.82	2.61	100.0	6.8	9.5	----	6.2	8.8	----	20.3
Eczema (pt. 154)	3.38												
Sole		140	90.9	4.14	4.56	98.6	15.0	10.7	3.6	12.5	12.1	6.9	16.1

TABLE 2.—*Mean calls by any practitioner within the year of observation per case of illness from specific causes, and the proportion of cases and calls for different types or practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of calls by—: Specialist	Percent of calls by—: Public clinic	Percent of calls by—: Nonmedical practitioner	Percent of general physician's cases with home calls
Skin diseases—Continued.													
Other and ill-defined skin diseases (151, pt. 154, pt. 205)	11.18												
Sole		402	90.1	3.66	4.06	91.3	19.7	3.0	10.4	24.6	2.5	12.1	16.2
Complicated		18	94.7	8.21	8.67	100.0	27.8	5.6	----	18.6	1.3	----	42.9
Female genital and puerperal diagnoses:													
Cysts and tumors of ovary and uterus (137, 139)	[11] 2.77												
Sole		33	100.0	8.97	8.97	100.0	36.4	9.1	6.1	12.2	2.0	8.1	55.6
Complicated		13	100.0	10.92	10.92	100.0	69.2	----	----	10.6	----	----	45.5
Salpingitis and pelvic abscess (138)	[11] 1.62												
Sole		17	100.0	12.88	12.88	100.0	23.5	5.9	----	12.8	.9	----	68 8
Complicated		15	100.0	15.87	15.87	100.0	33.3	13.3	6.7	36.6	5.9	11.3	71.4
Menstrual disorders (140, pt. 141)	[11] 11.53												
Sole		185	87.3	3.48	3.98	94.6	4.3	.5	5.9	2 4	.1	6.2	42 5
Complicated		17	89.5	9.89	11.06	100.0	5.9	11.8	----	1.1	5.9	----	46.7
Other and ill-defined nonvenereal diseases of female organs, including chronic results of childbirth (pt. 141, 142, pt. 145, pt. 149)	[11] 15.77												
Sole		228	94.2	6.26	6.65	96.9	19.7	3.1	6.1	14.1	3.1	8.1	38.0
Complicated		77	96.3	13.83	14.36	98.7	36.4	9.1	5.2	20.8	3.4	14.4	56.4
Acute complications of pregnancy and childbirth (pt. 143, 144, pt. 145, 146–148, pt. 149)	[11] 3.25												
Sole		37	100.0	5.78	5.78	94 6	16.2	8.1	5.4	7.0	7.5	7.9	70.4
Complicated		26	100.0	19.54	9.54	100.0	38.5	----	3.8	33.7	----	5.9	73.9
Abortions, miscarriages, and stillbirths (pt. 143)	[11] 7.67												
Sole		132	97.1	5.11	5.27	99.2	18.9	3.8	1.5	11.1	4.3	1.2	80.0
Complicated		13	100.0	15.62	15.62	100.0	----	7.7	7.7	----	2.0	14.8	100.0
Live births (pt. 145, pt. 149)	[11] 40.01												
Sole		732	99.6	8 35	8.30	97.1	7.7	13.1	3.4	9.2	8.4	3.4	78.1
Complicated		26	100.0	16.27	16.27	100.0	34.6	----	----	31.4	----	----	77.3
Puerperal diseases of the breast (150)	[11] 2.06												
Sole		33	100.0	5 36	5.36	100.0	3.0	9.1	----	2.8	3.1	----	66.7
Accidental injuries:													
Poisoning by ivy, oak, and other plants (pt. 177)	1.71												
Sole		69	71.9	1.39	1.93	100.0	8.7	1.4	----	7.5	2.3	----	26.2
Other accidental poisonings (175, 176, pt. 177)	2.63												
Sole		105	89.7	1.68	1.88	99.0	3.8	2.9	1.0	3.0	2.0	1.0	57.1
Automobile accidents (pt. 188)	4.98												
Sole		180	95.2	7.12	7.47	97.2	16.7	9.4	2.8	12.0	2.8	5.0	66.9
Accidental burns (179)	2.50												
Sole		101	66.4	2.93	4.41	99.0	5.0	5.9	1.0	4.0	7.4	.2	44.4
Accidental injuries by cutting or piercing instruments (184)	5.88												
Sole		247	85.8	3.29	3.84	99.2	4.0	8.9	.8	2.5	5.9	.6	27.4
Accidental falls (185)	4.92												
Sole		173	90.6	2.83	3.13	94.8	7.5	5.2	6.9	5.4	3.5	7.4	59.9
Eye accidents (pt. 85, pt. 202)	2.88												
Sole		115	97.5	2.87	2.95	99.1	38.3	5.2	.9	37.2	2.7	.3	20.5
Injuries by animals (189)	1.01												
Sole		45	88.2	2.84	3.22	100.0	----	6.7	----	----	8.3	----	34.1

[11] Rates for female genital and puerperal diagnoses are expressed as cases per 1,000 females.

TABLE 2.—*Mean calls by any practitioner within the year of observation per case of illness from specific causes, and the proportion of cases and calls for different types or practitioners—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued

Disease and whether sole diagnosis or complicated by another disease	Attended cases per 1,000 population (adjusted)	Number of attended cases	Percent of cases attended by any practitioner	Mean calls by any practitioner: Per total case	Mean calls by any practitioner: Per attended case	Percent of attended cases attended by—: Any physician or clinic (all M. D.)	Percent of attended cases attended by—: Specialist	Percent of attended cases attended by—: Public clinic	Percent of attended cases attended by—: Nonmedical practitioner	Percent of calls by—: Specialist	Percent of calls by—: Public clinic	Percent of calls by—: Nonmedical practitioner	Percent of general physician's cases with home calls
Accidental injuries—Continued.													
All other accidents (165–174, 178, 180–183, 186, 187, pt. 188, 190–200, 201, pt. 202)	40.24												
Sole		1,516	92.7	4.06	4.38	96.0	5.4	7.2	5.5	6.6	5.7	8.9	35.3
Complicated		31	96.9	10.34	10.68	100.0	19.4	6.5	----	18.4	1.2	----	63.3
All other diseases:													
Anemia, all forms (58)	4.10												
Sole		106	93.0	7.81	8.40	100.0	10.4	5.7	----	2.5	4.3	----	25.3
Complicated		32	100.0	16.00	16.00	96.9	25.0	9.4	6.3	18.8	4.7	11.7	42.9
Diseases of thyroid gland (60)	3.53												
Sole		105	92.9	8.62	9.28	95.2	27.6	9.5	6.7	23.6	3.7	12.5	14.7
Complicated		19	90.5	8.33	9.21	94.7	15.8	----	10.5	5.7	----	18.9	46.7
Acidosis (pt. 69)	1.54												
Sole		59	95.2	2.24	2.36	98.3	10.2	1.7	1.7	9.4	2.2	4.3	39.6
Sty (pt. 85)	1.21												
Sole		50	82.0	1.90	2.32	100.0	28.0	6.0	----	41.4	2.6	----	17.6
Conjunctivitis, pinkeye, sore eye (pt. 85)	3.38												
Sole		144	72.4	1.49	2.06	100.0	24.3	5.6	.7	40.9	3.7	1.7	23.7
Other eye diseases (pt. 85)	4.76												
Sole		153	96.2	5.23	5.44	96.1	57.5	7.8	5.9	66.0	8.8	6.5	16.7
Complicated		17	100.0	10.41	10.41	100.0	70.6	----	----	28.8	----	----	40.0
Hemorrhoids (pt. 93)	2.80												
Sole		89	89.0	3.48	3.91	92.1	15.7	2.2	7.9	22.1	2.0	11.2	27.3
Diseases of lymphatic system (94)	3.93												
Sole		150	87.7	4.02	4.58	97.3	14.0	4.0	4.0	15.9	2.0	4.4	54.3
Complicated		48	78.7	3.49	4.44	100.0	25.0	6.3	2.1	26.3	1.9	1.4	64.1
Diseases of the teeth and gums (pt. 108)	9.74												
Sole		365	92.4	1.52	1.64	42.7	1.6	1.4	.5	1.0	1.0	.8	50.0
Complicated		44	83.0	2.21	2.66	95.5	4.5	4.5	2.3	1.7	6.0	.9	61.5
Pyelitis (pt. 131)	2.18												
Sole		80	98.8	6.15	6.23	100.0	10.0	2.5	1.3	9.6	7.8	2.2	62.5
Complicated		12	100.0	14.08	14.08	100.0	33.3	----	----	28.4	----	----	75.0
Circumcision (pt. 136)	[13] 3.21												
Sole		80	100.0	2.26	2.26	97.5	11.3	5.0	2.5	10.5	4.4	1.7	60.9
Complicated		15	100.0	3.27	3.27	100.0	13.3	13.3	----	8.2	8.2	----	42.0
Diseases of bones and joints, except tuberculosis and rheumatism (155, 156)	2.19												
Sole		69	94.5	9.93	10.51	81.2	30.4	8.7	29.0	17.9	4.6	28.7	30.6
Ill-defined orthopedic conditions and diseases of the organs of locomotion, except lumbago, myalgia, and myositis (157, pt. 158, pt. 205)	4.69												
Sole		165	94.3	7.22	7.65	77.0	32.1	17.6	28.5	32.4	5.3	38.2	27.9
Congenital malformations and diseases of early infancy (159–163)	1.43												
Sole		69	100.0	6.22	6.22	97.1	30.4	20.3	2.9	25.2	8.6	37.3	62.5
Foot trouble (pt. 205)	3.07												
Sole		102	98.1	2.70	2.75	2.9	2.0	----	99.0	.7	----	98.9	100.0
Headache (pt. 205)	3.29												
Sole		109	46.6	.97	2.07	83.5	3.7	4.6	19.3	4.4	5.3	28.8	38.7
Backache (pt. 205)	2.60												
Sole		83	81.4	3.86	4.75	45.8	2.4	----	60.2	2.0	----	78.2	20.0
Debility, fatigue, exhaustion, malnutrition, loss of weight (pt. 205)	5.63												
Sole		182	78.1	2.73	3.50	87.9	4.9	9.3	13.2	2.0	14.8	20.1	29.1
Complicated		22	100.0	4.18	4.18	81.8	4.5	9.1	13.6	2.2	19.6	41.3	26.7
Rash, unqualified (pt. 205)	1.87												
Sole		83	89.2	1.37	1.53	98.8	12.0	6.0	1.2	17.3	3.9	.8	29.4

[13] Rate for circumcision is expressed as cases per 1,000 males.

Of the total illnesses from all causes, 78 percent [13] were attended by some type of practitioner, with an average of 3.3 calls per total case (attended or not attended) and of 4.2 calls per attended case. Of all attended cases, 96 percent had the attendance of one or more physicians [14] (M. D. including general physician, specialist, and clinic or hospital physician). Specialists attended 12.8 percent of the cases, public clinics 4.8 percent, and nonmedical practitioners 4.3 percent, with or without the attendance of other practitioners on the same case. Of all attended cases, 90 to 95 percent had one doctor only. Of the calls by all types of practitioners, 91 percent were by physicians including specialists and clinic and hospital physicians, 14.3 percent by specialists, 4.7 percent by public clinics, and 8.7 percent by nonmedical practitioners.[15]

Considering calls per total case (sole or primary diagnoses) minor respiratory (1.6 calls) had the smallest average, and degenerative, diseases (7.7 calls) had the largest. In terms of calls per attended case, the average for minor digestive was the same as that for minor respiratory diseases, 2.4 calls, but degenerative remained at the top with 8.1 calls per attended case. Without exception in these 13 broad groups, the complicated cases (2 or more diagnoses) had on the average considerably more calls per case than those with only one diagnosis.

Considering sole or primary causes, 43 percent of the cases of ear and mastoid diseases were attended by a specialist, with major respiratory second (37 percent), and major digestive third (23 percent). Likewise in percentage of calls by a specialist, these three diagnoses stand at the top.

[13] In some preceding papers the percentages of cases attended have been computed from adjusted rates for total cases and for attended cases. In the present paper all such percentages are computed from the actual cases and are comparable only with those so computed in the preceding paper (*16*). Usually the differences resulting from the two methods are small.

[14] Numbers attended (one or more calls) by one or more M. D.'s were 24,432 cases; by private general medical practitioners, 20,705 cases, by specialists, 3,280 cases; by public clinic physicians, 1,225 cases; and by private group clinic physicians, 327 cases The cases for the various types of physicians add to more than the total for all M. D.'s because some had two or more types of physicians.

Of all cases attended by private general medical practitioners 86 percent were attended by the family physician and 15 percent by some other general practitioner, about 1 percent being attended by both. Of all cases attended by general practitioners, 5.8 percent had a specialist also, presumably called in or referred to by the general physician. In about 1 percent of the cases a nonmedical practitioner was also in attendance at some time.

In 62 percent of all cases attended by specialists, the specialist was the only attendant, but in 37 percent a private general practitioner was also in attendance, presumably the original attendant who called in or referred the case to the specialist. In less than 1 percent of the cases a nonmedical practitioner was also in attendance at some time.

[15] Nonmedical practitioners include osteopath (452 cases), chiropractor (402 cases), Christian Scientist or other faith healer (24 cases), midwife (22 cases), naturopath and other nonmedical practitioners (75 cases), and also supplementary practitioners such as chiropodist (163 cases), physiotherapist without the supervision of a physician (28 cases), and optician (3 cases), but not dentist. The cases given above may add to more than the total for nonmedical practitioners because some cases may have had two or more types of nonmedical practitioners. The few *illnesses* attended by dentists (356 cases) are excluded from both the total M. D. and the nonmedical group but are counted as attended. For dental care (*13*) with or without sickness (10,116 cases) and eye refractions (*5*) with or without sickness (1,525 cases) in this group of families, see preceding papers

In these families fewer cases went to public clinics than to specialists. The diagnosis group with the highest proportion attended by a public clinic was major respiratory (10.9 percent), with female genital and puerperal (8.4 percent) second, and ear and mastoid (7.0 percent) third.

The percentage of all cases that had nonmedical practitioners was about the same as the percentage that went to public clinics, but the type of case was quite different. In the proportion of cases that went to nonmedical practitioners, rheumatic diseases such as arthritis, rheumatism, and neuritis (19 percent) were highest, other and ill-defined diseases (14 percent) second, and nervous diseases (12 percent) third.

Of more interest than the figures for these broad disease groups are data on the more specific diagnoses. As already noted, the mean calls per case and other indexes of severity are almost invariably greater for complicated cases (2 or more diagnoses) than for those with a single diagnosis. Therefore, in table 2 the data are shown for illnesses with a sole diagnosis and, if the numbers are sufficient, for cases complicated by one or more diseases other than the one under consideration.

Figure 1 shows attended cases per 1,000 population and figure 2 shows calls by all practitioners per attended case of sole diagnosis. In this study 78 percent of the cases were attended by some practitioner. Although the percentage attended is much lower for some diseases than for others, the order of the diagnoses with respect to frequency is not greatly different for attended cases as shown in figure 1 and for total cases as shown in a similar way in a preceding paper (*15*). Because only a small percentage of cases of coryza and colds are attended, influenza and grippe becomes the most frequent diagnosis among attended cases. But the next five minor respiratory diagnoses show the same order in attended as in total cases. Similarly, for a large number of other disease groups the order of frequency of the separate diagnoses is much the same whether total or attended cases are under consideration.

Among the 113 specific diagnoses (sole causes) shown in table 2 and figure 2, 46 showed 5 or more mean calls per attended case and 11 showed 10 or more. Typhoid fever, cancer, and cerebral hemorrhage were the three highest with more than 15 doctors' calls per attended case. At the other extreme, there were 15 of the 113 diagnoses with less than 2 calls per attended case, chickenpox, German measles, and rash (unqualified) being at the bottom with 1.5 calls. Since the averages shown in figure 2 are for attended cases, there is, by definition, at least one call for every case. For acute diseases, these averages of calls *within the study year* will represent the approximate averages for completed cases since only 5 percent of such acute cases were incomplete because of prior onset or because still sick at

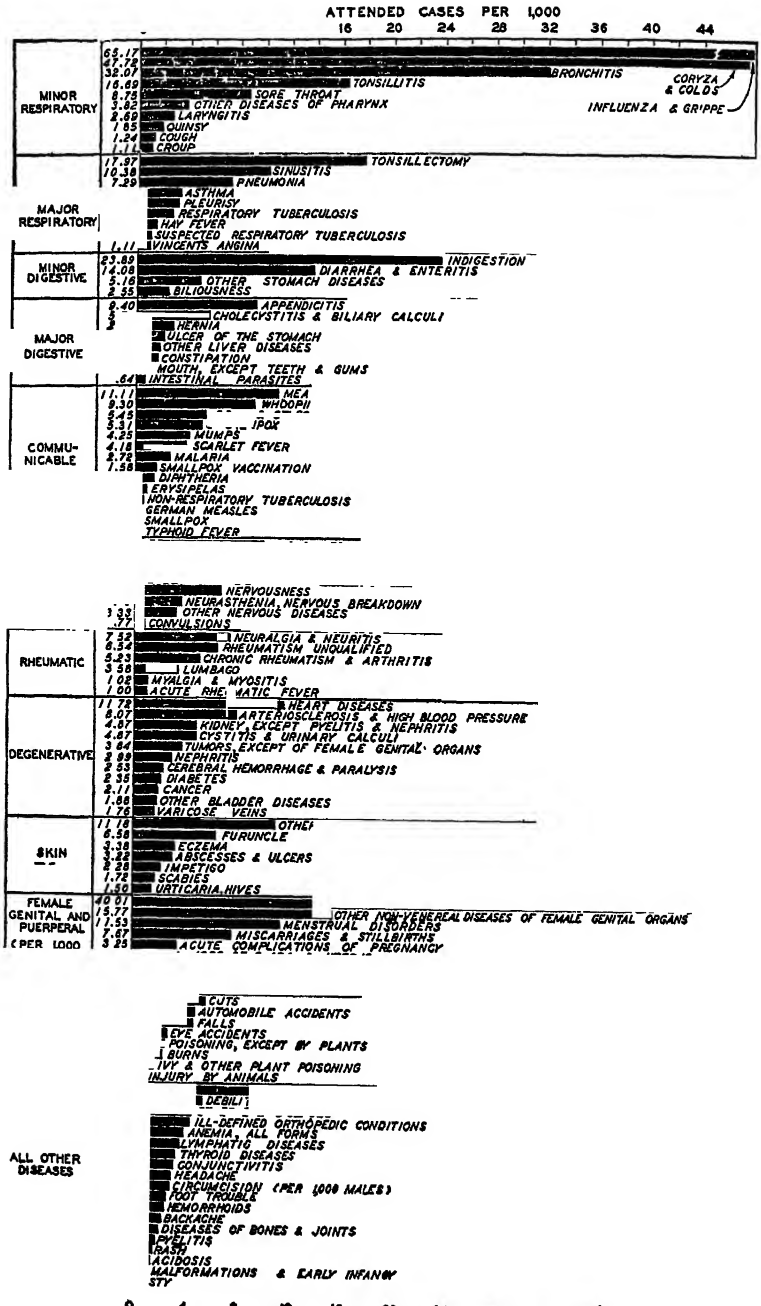


FIGURE 1.—Cases of specific diseases attended by any practitioner during the study year per 1,000 surveyed population—8,758 canvassed white families in 18 States during 12 consecutive months, 1928-31. (Sole, primary, and contributory causes; adjusted for age by an approximate method described in note 4 to table 2).

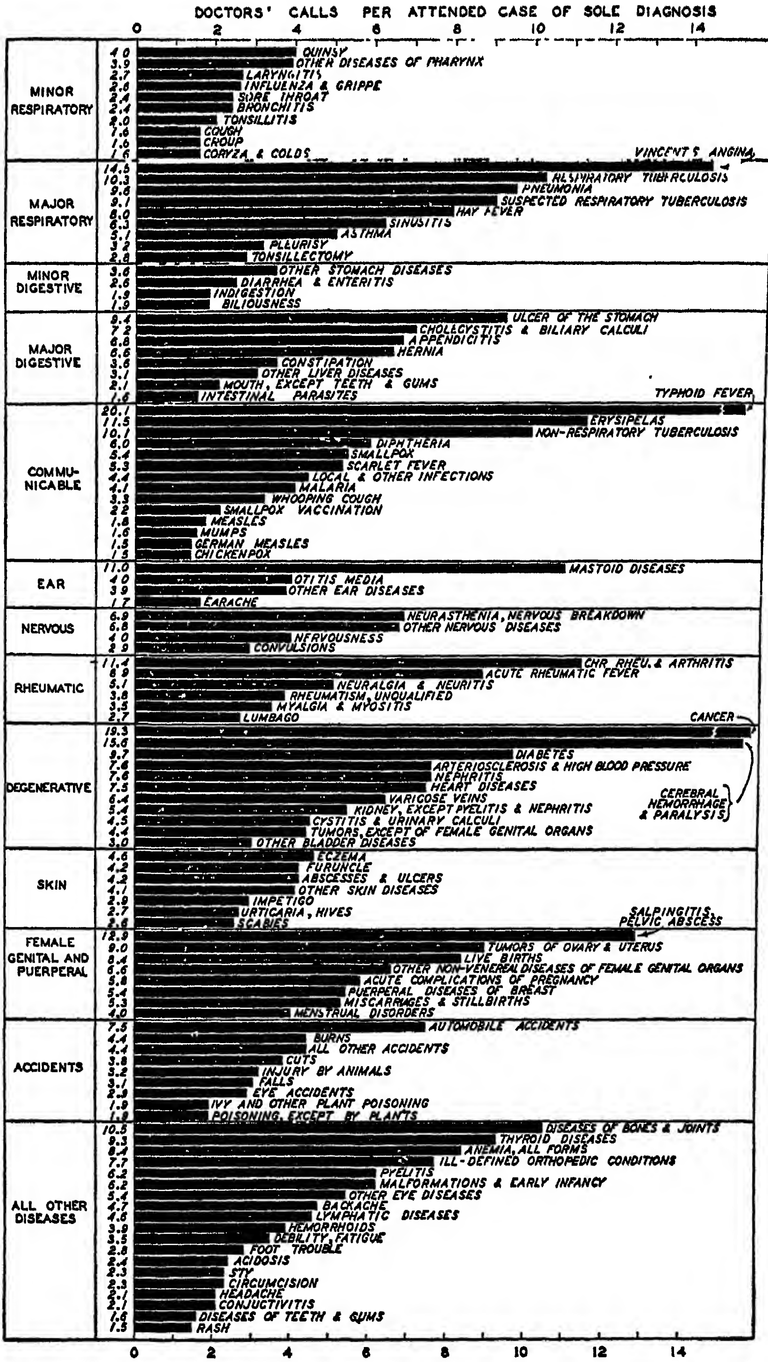


FIGURE 2.—Mean calls by all practitioners per attended case of sole diagnosis—8,758 canvassed white families in 18 States during 12 consecutive months 1928–31.

the last report on the case. However, of the diseases commonly considered as chronic, 43 percent were incomplete because of prior onset or because still sick at the last report, so average calls in such cases represent calls for one year rather than for the entire course of the disease. Considering calls per total case (attended or not attended) 42 of the 113 diagnoses (sole causes) had 5 or more mean calls per total case and 8 diseases had 10 or more mean calls per total case. The differences between these means and the mean calls per attended case vary with the proportion of cases attended. Of the 113 specific diagnoses (sole causes), 5 showed less than 50 percent of the cases attended by some practitioner; on the other hand, 94 showed 75 percent or more of the cases attended, 67 showed 90 percent or more, and 14 diagnoses showed all cases attended by some practitioner.

The extent to which specialists, public clinics, and nonmedical practitioners were consulted in connection with the various specific diagnoses is of interest. In this group of families, consultations with specialists were much more frequent than with public clinics or nonmedical practitioners. Of the 113 diagnoses (sole causes) there were 85 in which a specialist was consulted in 5 percent or more of the cases, but there were only 44 in which 5 percent or more of the patients attended public clinics and 36 diagnoses in which 5 percent or more of the patients consulted nonmedical practitioners.

Of the 113 diagnoses (sole causes) included in table 2, 58 showed a specialist for 10 percent or more of the cases, 37 for 15 percent or more, 26 for 20 percent or more, and 19 diagnoses showed a specialist for 25 percent or more of the cases. Similarly, of the 113 diagnoses (sole causes) there were 48 for which 10 percent or more of all calls were made by specialists, 34 with 15 percent or more, 25 with 20 percent or more, and 19 diagnoses for which 25 percent or more of all calls were made by specialists. The 8 specific diagnoses (sole causes) with the highest percentages of cases attended by specialists were: Mastoid diseases, 72 percent; eye diseases (except sty and conjunctivitis), 57 percent; ear diseases (except otitis media and earache), 54 percent; sinusitis, 52 percent; tonsillectomy, 52 percent; cancer, 50 percent; nonrespiratory tuberculosis, 48 percent; and otitis media, 39 percent.

Of the 113 diagnoses (sole causes) in table 2, 44 showed attendance at public clinics for 5 percent or more of the cases, 26 for 7 percent or more, and 12 diagnoses for 10 percent or more. The corresponding figures for calls are: 32 of the 113 diagnoses (sole causes) showed 5 percent or more of all calls made to public clinics, 22 showed 7 percent or more, and 9 showed 10 percent or more. The 8 specific diagnoses for which the highest percentages of patients attended public clinics were: Respiratory tuberculosis, 49 percent; suspected respiratory tuberculosis, 47 percent; reaction from smallpox vaccination, 30

percent; nonrespiratory tuberculosis, 29 percent; congenital malformations and diseases of early infancy, 20 percent; ill-defined orthopedic conditions, 18 percent; confinement with live birth, 13 percent; and tonsillectomy, 13 percent.

Of the total of 113 diagnoses (sole causes), 36 showed a nonmedical practitioner for 5 percent or more of the cases, 23 for 7 percent or more, and 17 for 10 percent or more. In terms of calls, nonmedical practitioners showed more attendance; of the 113 diagnoses (sole causes), 46 showed 5 percent or more of all calls made by nonmedical practitioners; 39 showed 7 percent or more, and 31 diagnoses showed 10 percent or more. The 8 specific diagnoses with the highest percentages of cases attended by nonmedical practitioners were: Foot trouble, 99 percent (chiropodists); backache, 60 percent; myalgia and myositis, 56 percent; diseases of the bones and joints, 29 percent; ill-defined orthopedic conditions, 28 percent; lumbago, 23 percent; acute rheumatism, 21 percent; and chronic rheumatism and arthritis, 20 percent. The 8 specific diagnoses for which the highest percentages of all calls were made by nonmedical practitioners were: Foot trouble, 99 percent (chiropodists); backache, 78 percent; myalgia and myositis, 76 percent; ill-defined orthopedic conditions, 38 percent; congenital malformations and diseases of early infancy, 37 percent; neuralgia and neuritis, 37 percent; lumbago, 35 percent; and chronic rheumatism and arthritis, 34 percent. Thus it appears that the ill-defined chronic aches and pains reported under such names as rheumatism, neuralgia, myalgia, lumbago, and backache are the diagnoses for which the patient most frequently goes to a nonmedical practitioner. Although some of this showing may result from less accurate and precise diagnosis by nonmedical practitioners, the tendency for this type of ailment to get to the nonmedical practitioners seems fairly clear.

Cases attended by different kinds of specialists.—In an earlier section it was indicated that 12.8 percent of all cases were attended by specialists (with or without some other attendant) and 14.3 percent of all calls were made by specialists. Table 3 shows the kind of specialist that was most frequently consulted. Of all the cases (sole or primary) which had one or more kinds of specialists in attendance, 40 percent had an eye, ear, nose, or throat specialist, 22 percent a pediatrician, 15 percent a surgeon without other designation of specialty, 5.1 percent an internal medicine specialist, 4.3 percent a specialist in obstetrics or gynecology, 4.1 percent an orthopedic specialist, 3.6 percent a dermatologist, 1.5 percent a urologist, 1.3 percent a neurologist, 0.7 percent a tuberculosis specialist, and 5.2 percent a specialist of some other or unknown type. If the same case had two kinds of specialists it is counted for both types in the above computations.

TABLE 3.—*Types of specialists[1] who attended illnesses from broad groups of causes—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

[Sole and primary causes only]

Diagnosis group[2]	Cases with one or more kinds of specialists[3] No.	Cases with one or more kinds of specialists[3] Percent	Eye, ear, nose, and throat	Pediatrics	Internal medicine	Gynecology and obstetrics	Orthopedics	Dermatology	Urology and proctology	Neurology and psychiatry	Tuberculosis	Surgery[4]	All other specialties
			Percent of cases with each type of specialist[5]										
All causes	3300	100	40.5	21.9	5.1	4.3	4.1	3.6	1.5	1.3	0.7	14.7	5.2
Minor respiratory diseases	567	100	46.4	48.5	1.2	.7	----	.2	.2	.2	1.4	----	2.6
Other respiratory diseases	733	100	72.4	7.2	2.3	.1	----	.1	----	----	1.8	15.6	3.1
Minor digestive diseases	118	100	1.7	79.7	14.4	----	----	----	.8	.8	----	----	5.1
Other digestive diseases	215	100	1.9	5.6	14.0	1.4	----	.5	.9	.9	----	69.3	9.3
Communicable diseases	150	100	14.0	65.3	6.0	----	6.7	2.7	----	.7	----	4.7	3.3
Ear and mastoid diseases	292	100	88.7	10.3	----	.3	----	----	----	----	----	2.7	.3
Nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis	42	100	4.8	21.4	14.3	----	7.1	----	----	42.9	----	4.8	14.3
Rheumatism and related diseases	39	100	20.5	7.7	7.7	2.6	30.8	----	----	10.3	----	2.6	17.9
Degenerative diseases	172	100	9.9	6.4	22.1	3.5	1.7	4.7	16.9	3.5	----	23.8	13.4
Skin diseases	140	100	6.4	15.0	2.1	----	2.1	62.9	.7	----	----	6.4	7.9
Female genital and puerperal diagnoses	188	100	--	1.1	2.7	60.1	----	----	2.1	1.6	.5	31.4	4.3
Accidental injuries	205	100	30.2	15.6	1.0	1.0	16.1	3.4	1.0	.5	----	24.4	8.8
All other diseases	439	100	36.0	18.9	7.1	2.3	16.2	2.3	1.8	1.4	.5	10.0	6.8

[1] Specialties are given as reported by the canvassed families.
[2] For inclusions in the diagnosis groups in terms of International List numbers, see table 1; figure 1 shows the frequency of attended cases for specific diagnoses included in each broad group.
[3] Includes a few cases (20 for all causes) in which the specialist did not see the patient but was consulted by telephone or by another member of the family. Preceding papers and tables excluded these few cases from those attended by specialists.
[4] Includes only surgeons not designated as to anatomical field of surgery.
[5] If same case had 2 or more types of specialists, each type is counted but the case counts only once in the total; therefore, the percentages may add to more than 100.

The kind of specialist that predominated among those consulted for cases of the different broad diagnosis groups is of interest. In ear and mastoid and respiratory diseases, eye, ear, nose, or throat specialists predominated; for ear diseases 89 percent of the specialists were of this type, for major (other) respiratory 72 percent, and for minor respiratory 46 percent which was second only to pediatrician with 48 percent for this group. Even in accidental injuries 30 percent of the specialists were eye, ear, nose, or throat specialists and for rheumatism and related diseases the percentage was 21, presumably because of the frequent searches for foci of infection in the tonsils and sinuses. The pediatrician was the predominant type of specialist consulted for minor digestive diseases, 80 percent; communicable diseases, 65 percent; and minor respiratory diseases, 48 percent. In major (other) digestive cases, 69 percent of the specialists consulted were designated merely as surgeons; apparently "surgeon" refers largely to one who does abdominal surgery, as this group of major digestive diseases includes appendicitis, hernia, cholecystitis, biliary calculi and other diseases of the digestive tract. However, the specialist was also frequently designated only as surgeon in other diagnosis groups, includ-

ing female genital and puerperal, 31 percent; accidental injuries, 24 percent; degenerative diseases, 24 percent; and major (other) respiratory (including tonsillectomy), 16 percent.

Medical services for complicated cases.—Most of the above discussion of doctors' calls has pertained to illnesses with only one diagnosis. Almost without exception the complicated illnesses (2 or more diagnoses) had more average calls per case than those with a single diagnosis. Figure 3 gives for each of the 13 broad diagnosis groups

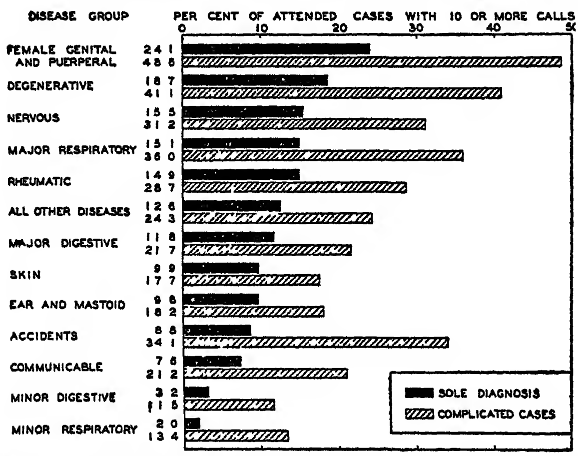


FIGURE 3.—Proportion of attended cases that had 10 or more calls by all practitioners during the study year for illnesses with sole diagnosis and for complicated cases—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31.

the percentage of cases that had 10 or more calls, illnesses with a sole diagnosis being shown separately from those with 2 or more diagnoses. In every diagnosis group the percentage with 10 or more calls is much greater for complicated cases than for those with only one diagnosis. On the other hand, the percentage of attended cases that had only one call is greater in every diagnosis group for illnesses with a single diagnosis.

There were 63 diagnoses with enough complicated cases to be included in table 2. Of these 63 diseases, 47 diagnoses for complicated illnesses had 90 percent or more of the cases attended by a doctor, as compared with 38 diagnoses for illnesses with a sole cause only. The corresponding figures for diseases with all cases attended by a doctor are 28 diagnoses (among the total of 63) for complicated cases and 7 for those with a sole diagnosis.

Of the 63 diagnoses with data for both sole and complicated cases, 28 of the complicated illnesses had means of 10 or more calls per attended case, as compared with 5 diagnoses for illnesses of sole cause only. At the other extreme, there were, among the 63 diagnoses, 13 diagnoses for complicated illnesses with less than 5 mean calls per

attended case, as compared with 34 diagnoses for illnesses of sole cause.

Similar figures for mean calls per total case (attended or not attended) are 26 diagnoses (among the total of 63) for complicated cases with more than 10 calls per total case as compared with only 4 diagnoses for cases with sole cause. At the other extreme, there were 15 of the 63 diagnoses for complicated cases with less than 5 mean calls per total case as compared with 38 diagnoses for cases with sole cause only.

III. DISTRIBUTION OF ILLNESSES ACCORDING TO CALLS BY ALL PRACTITIONERS

Table 4 shows in 13 broad diagnosis groups the distribution of the attended cases according to the number of calls by all types of practitioners. Since a given case may have had 3 calls from the family physician, 1 call from another general practitioner, and 2 calls from a specialist, the best single statement of total services seems to be obtained by classifying this as a 6-call case, comparable with other cases in which 6 calls were received from the one family physician or from one specialist.[16]

Considering illness from all causes, 40 percent of the attended cases had only a single call, presumably in many cases for diagnosis or for diagnosis and a prescription. This large percentage with a single call may frequently reflect the state of mind of the patient in which it is important to have a diagnosis and check-up, but with that information it is only a question of taking the medicine and awaiting recovery without further medical attention. On the other hand, the large percentage of cases with a single call may often reflect the inadequacy of medical care in which so many patients do not receive needed calls to check on the progress of the disease.

The minor digestive diseases, with 55 percent of the attended cases (sole or primary causes) with only a single call, and the minor respiratory, with 50 percent, are the groups with the highest proportions. At the other extreme are female genital and puerperal diagnoses with 15 percent of the attended cases with only one call.

[16] Since calls refer to those made *within the study year*, they are understated for some cases because they do not include service received prior to the beginning or after the close of the study year. This would apply particularly to the long-duration chronic diseases. However, the incomplete cases average longer durations and presumably more calls than complete cases of similar diagnoses, so their exclusion would bias the data even further toward smaller numbers of calls per case.

Similarly, hospitalization and care by staff physicians might be a substitute for calls by private doctors; however, hospital cases average more calls per case (before and after hospitalization and by private doctors during hospitalization) than nonhospital cases of similar diagnoses, so their exclusion would also bias the data toward smaller numbers of calls per case.

TABLE 4.—*Distribution of illnesses*[1] *from broad groups of causes according to the number of calls by all practitioners within the year of observation—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Disease group and whether sole cause or primary of 2 or more diagnoses[2]	Attended cases with known number of calls		Percent of attended cases with the specified number of calls										
	Number	Percent	1	2	3	4	5	6–7	8–9	10–14	15–19	20–29	30 and over
All causes:													
Sole or primary	23,957	100	40.0	19.6	11.2	6.4	4.3	5.5	3.2	4.5	2.0	1.8	1.4
Sole	22,752	100	41.0	19.8	11.2	6.4	4.2	5.3	3.1	4.3	1.9	1.5	1.2
Complicated	2,511	100	21.0	14.0	10.8	7.0	5.6	9.4	5.9	9.2	4.7	6.4	6.0
Minor respiratory diseases:													
Sole or primary	7,054	100	50.1	22.5	11.4	5.4	2.9	3.5	1.5	1.9	.4	.3	.2
Sole	6,654	100	51.3	22.8	11.4	5.3	2.8	3.1	1.3	1.5	.2	.1	.2
Complicated	498	100	29.1	17.7	11.6	8.8	5.0	10.0	4.2	7.2	2.4	2.0	1.8
Other respiratory diseases:													
Sole or primary	1,745	100	23.7	22.3	11.0	8.5	7.2	6.5	4.6	6.3	3.7	3.7	2.8
Sole	1,638	100	24.7	22.8	11.0	8.5	7.1	6.3	4.4	6.3	3.7	3.3	1.8
Complicated	253	100	9.1	12.8	8.3	7.5	8.7	9.5	8.7	11.1	4.7	11.1	9.1
Minor digestive diseases:													
Sole or primary	1,697	100	55.3	22.9	8.5	4.2	2.5	2.2	.9	1.7	.9	.2	.6
Sole	1,638	100	56.0	23.2	8.4	4.2	2.6	2.0	.5	1.5	.9	.2	.6
Complicated	139	100	38.8	15.1	12.2	7.9	2.2	6.5	5.8	5.0	2.9	.7	2.9
Other digestive diseases:													
Sole or primary	886	100	32.6	16.0	14.2	6.4	5.1	8.0	4.5	4.1	2.7	3.8	3.0
Sole	806	100	34.2	16.4	14.5	5.8	5.2	7.8	4.2	4.1	2.2	2.9	2.6
Complicated	138	100	16.7	14.5	12.3	10.1	6.5	10.9	7.2	3.6	5.1	7.2	5.8
Communicable diseases:													
Sole or primary	2,367	100	41.7	18.7	13.0	6.0	4.1	5.7	2.6	4.1	1.9	1.4	.8
Sole	2,244	100	42.6	18.6	13.2	6.1	4.0	5.5	2.5	4.0	1.7	1.1	.8
Complicated	174	100	24.1	21.3	10.3	5.2	5.2	8.0	4.6	8.0	5.2	5.7	2.3
Ear and mastoid diseases:													
Sole or primary	665	100	37.3	17.6	14.0	6.2	3.9	5.9	4.7	5.1	2.7	1.8	.9
Sole	638	100	38.6	17.1	14.3	6.0	3.9	6.0	4.4	5.0	2.8	1.4	.6
Complicated	193	100	20.2	17.6	9.3	9.3	5.2	10.9	9.3	7.8	2.6	5.2	2.6
Nervous diseases, except cerebral hemorrhage, paralysis, neuralgia, and neuritis:													
Sole or primary	430	100	33.3	16.7	11.9	5.6	3.7	9.1	4.4	6.7	3.3	3.0	2.3
Sole	412	100	34.2	17.0	11.7	5.3	3.6	8.7	3.9	6.8	3.4	2.9	2.4
Complicated	64	100	20.3	9.4	6.3	9.4	7.8	9.4	6.3	12.5	3.1	7.8	7.8
Rheumatism and related diseases:													
Sole or primary	665	100	33.2	19.5	9.9	7.8	4.1	5.6	4.1	6.5	2.9	3.8	2.7
Sole	640	100	33.6	20.2	10.0	8.0	4.1	5.5	3.9	5.9	2.7	3.6	2.7
Complicated	87	100	25.3	13.8	9.2	1.1	5.7	9.2	6.9	11.5	4.6	5.7	6.9
Degenerative diseases:													
Sole or primary	1,097	100	24.6	16.4	9.8	6.9	5.7	7.6	6.1	7.3	4.1	5.4	6.0
Sole	921	100	26.8	17.7	10.3	7.5	5.4	7.5	6.1	6.6	3.5	4.1	4.5
Complicated	365	100	14.0	9.3	8.2	4.9	6.0	9.9	6.6	10.7	8.5	9.6	12.8
Skin diseases:													
Sole or primary	1,098	100	41.7	18.2	12.6	6.2	3.9	4.7	2.8	5.6	1.5	1.8	1.1
Sole	1,080	100	42.2	18.2	12.3	6.3	4.0	4.4	2.8	5.6	1.5	1.7	1.1
Complicated	62	100	14.5	11.3	29.0	4.8	3.2	11.3	8.1	1.6	4.8	9.7	1.6
Female genital and puerperal diagnoses:													
Sole or primary	1,412	100	14.9	11.7	10.7	9.0	7.4	11.3	9.0	13.0	6.6	4.1	2.3
Sole	1,323	100	15.7	12.0	10.9	9.1	7.4	11.4	9.3	12.5	6.4	3.6	1.6
Complicated	179	100	5.6	7.8	8.9	7.3	6.1	11.2	4.5	16.8	6.7	11.7	13.4
Accidental injuries:													
Sole or primary	2,497	100	37.3	18.1	10.8	8.2	5.2	7.9	3.3	4.0	2.2	1.7	1.3
Sole	2,459	100	37.6	18.3	10.6	8.2	5.2	7.9	3.4	3.8	2.1	1.6	1.3
Complicated	47	100	14.9	12.8	21.3	4.3	6.4	6.4	----	14.9	6.4	8.5	4.3
All other diseases:													
Sole or primary	2,344	100	39.8	18.1	9.9	5.9	4.5	5.0	3.4	6.5	2.0	2.1	2.3
Sole	2,290	100	40.5	18.3	9.7	5.9	4.5	5.0	3.4	6.3	1.9	2.1	2.3
Complicated	312	100	28.8	13.1	11.5	6.1	4.8	7.1	4.2	9.9	4.8	4.8	4.8

[1] The table includes only illnesses with known numbers of calls. A small number of cases with 2 or more types of attendants had a known number of calls by one and an unknown number by the other. Since cases with 2 attendants usually received more calls than those with only 1, their exclusion would bias the distribution toward fewer calls. Therefore, in such instances 1 call was added to the known number and the sum used as representing the minimum calls for the case. For method of handling such unknowns in computing means, see note 5 to table 1. Home, office, and clinic calls by any practitioner are all included. Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but only for the calls that came within the study year.

[2] A case is considered as complicated if another diagnosis is reported as occurring simultaneously with or as overlapping the period of sickness from the diagnosis listed regardless of which diagnosis was classified as the primary cause of the illness. The complication may have a definite relationship to the other diagnosis (as in measles and pneumonia), or be apparently unrelated (as in measles and chickenpox). For inclusions in the diagnosis groups in terms of International List numbers, see table 1; table 2 and figures 1 and 2 show the frequency of attended cases and the mean calls per case for specific diagnoses included in the broad groups.

Table 5 shows for specific diseases distributions of attended cases according to total calls, similar to those in table 4. However, the small numbers of complicated cases are omitted, the table showing only those with a single diagnosis. It includes all diagnoses with 25 or more attended cases with a known number of doctors' calls; thus some diagnoses for which the average calls per case appear in table 2 are not included in table 5 because the numbers are too small to give reliable distributions. In computing the distributions, cases with an unknown number of calls are omitted.

TABLE 5.—*Distribution of illnesses from specific causes*[1] *according to the number of calls by all practitioners within the year of observation—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

(Sole diagnosis only)

Diagnosis and International List numbers, 1920 revision	Attended cases with known number of calls		Percent of attended cases with the specified number of calls										
	Number	Percent	1	2	3	4	5	6–7	8–9	10–14	15–19	20–29	30 and over
Minor respiratory diseases:													
Influenza and grippe (11)	2,329	100	42.9	22.7	14.7	6.7	4.0	4.8	1.4	2.2	0.3	0.2	0.2
Bronchitis and chest colds (99)	1,235	100	42.5	30.6	13.3	4.5	2.7	2.0	2.2	1.7	.3	.2	-----
Coryza and colds, unqualified (pt. 97, pt. 107)	1,719	100	68.1	17.9	5.9	3.8	1.9	1.3	.6	.5	-----	.1	-----
Cough (pt. 107)	49	100	63.3	22.4	4.1	6.1	-----	-----	2.0	2.0	-----	-----	-----
Tonsillitis (pt. 109)	669	100	54.6	22.7	11.7	4.9	1.5	2.4	.9	.9	.3	.1	-----
Quinsy (pt. 109)	62	100	20.0	16.1	14.5	8.1	3.2	17.7	1.6	9.7	-----	-----	-----
Sore throat (pt. 109)	317	100	54.6	23.3	9.5	4.4	2.2	2.2	1.9	.9	.3	-----	.6
Other pharynx and tonsil affections, except tonsillectomy (pt. 109)	125	100	36.0	24.0	13.6	10.4	.8	5.6	2.4	4.0	1.6	-----	1.6
Laryngitis (pt. 98)	91	100	54.9	16.5	12.1	4.4	3.3	2.2	2.2	1.1	1.1	1.1	1.1
Croup (pt. 98)	58	100	65.5	19.0	3.4	3.4	5.2	3.4	-----	-----	-----	-----	-----
Other respiratory diseases:													
Tonsillectomy and adenoidectomy (pt. 109)	611	100	26.9	40.1	14.5	7.3	5.0	3.1	1.1	1.1	.3	.5	-----
Pneumonia, all forms (100, 101)	233	100	4.7	7.3	7.7	11.6	10.8	12.9	12.9	15.9	6.4	5.6	4.7
Sinusitis (pt. 97)	319	100	28.2	11.3	11.9	7.2	9.1	8.5	5.0	8.2	3.8	4.7	2.2
Asthma (105)	98	100	36.7	17.3	6.1	8.2	6.1	5.1	1.0	6.1	9.2	3.1	1.0
Hay fever (pt. 107)	51	100	25.5	11.8	7.8	9.8	2.0	5.9	-----	9.8	15.7	11.8	-----
Pleurisy (102)	72	100	48.1	20.8	9.7	6.9	5.6	4.2	4.2	1.4	2.8	1.4	-----
Respiratory tuberculosis (pt. 31)	76	100	13.2	14.5	1.3	7.9	6.6	9.2	7.9	13.2	9.2	10.5	6.6
Suspected respiratory tuberculosis (pt. 31)	34	100	11.8	23.5	5.9	17.6	5.9	2.9	8.8	11.8	2.9	2.9	5.9
Minor digestive diseases:													
Indigestion, upset stomach, and nausea (pt. 112)	853	100	59.6	23.0	8.4	4.1	1.8	1.2	.5	.9	.4	.1	.1
Biliousness (pt. 112)	90	100	67.8	24.4	2.2	2.2	1.1	-----	-----	1.1	-----	-----	1.1
Other and ill-defined stomach diseases (pt. 112)	167	100	41.9	24.0	9.0	4.8	6.0	5.4	.6	2.4	3.6	1.2	1.2
Diarrhea and enteritis (15, pt. 16, 113, 114)	528	100	52.7	28.1	9.1	4.4	3.0	2.5	.8	2.3	1.1	-----	1.1
Other digestive diseases:													
Ulcers of stomach and duodenum (111)	64	100	14.1	12.5	14.1	7.8	9.4	12.5	3.1	7.8	3.1	4.7	10.9
Intestinal parasites, except hookworm (116)	31	100	58.1	29.0	3.2	6.5	3.2	-----	-----	-----	-----	-----	-----

[1] The table includes only illnesses with a single diagnosis and with 25 or more attended cases with known numbers of calls. A small number of cases with two or more types of attendants had a known number of calls by one and an unknown number by the other. Since cases with two attendants usually receive more calls than those with only one, their exclusion would bias the distribution toward fewer calls. Therefore in such instances one call was added to the known number and the sum used as representing the minimum calls for the case. For method of handling such unknowns in computing means, see note 5 to table 1. Home, office, and clinic calls by any practitioner are all included.

Cases with onset prior to the study and those still sick on the last visit are included along with completed cases, but only for the calls that came within the study year.

TABLE 5.—*Distribution of illnesses from specific causes according to the number of calls by all practitioners within the year of observation 8,758 canvassed white families in 18 States during 12 consecutive months, 1928 31*— Continued

(Sole diagnosis only)

Diagnosis and International List numbers, 1920 revision	Attended cases with known number of calls		Percent of attended cases with the specified number of calls										
	Number	Percent	1	2	3	4	5	6-7	8-9	10-14	15-19	20-29	30 and over
Other digestive diseases—Con.													
Appendicitis (117)	259	100	24.7	19.7	17.0	7.3	6.2	8.9	3.1	6.9	1.5	2.3	2.3
Hernia, intestinal obstruction (118)	72	100	26.4	19.4	16.7	11.1	2.8	8.3	4.2	2.8	4.2	1.4	2.8
Constipation (pt. 119)	50	100	58.0	8.0	12.0	2.0	4.0	2.0	4.0	2.0	2.0	6.0	-----
Biliary calculi, cholecystitis (123, pt. 124)	149	100	33.6	13.4	18.8	3.4	4.7	7.4	6.0	1.3	4.0	4.0	3.4
Other and ill-defined liver diseases (pt. 124)	54	100	50.0	14.8	13.0	3.7	1.9	7.4	1.9	5.6	-----	1.9	-----
Diseases of the mouth except teeth and gums (pt. 108)	50	100	64.0	16.0	4.0	4.0	2.0	6.0	4.0	-----	-----	-----	-----
Communicable diseases:													
Measles (7)	547	100	58.7	20.1	11.0	4.0	1.8	3.1	.9	.4	-----	-----	-----
Whooping cough (9)	482	100	30.5	14.9	22.0	11.6	7.3	6.2	2.5	2.7	1.0	.4	-----
Chickenpox (pt. 25)	259	100	65.3	24.7	4.2	1.2	2.8	.4	1.5	.4	-----	-----	-----
Mumps (13)	172	100	62.2	20.9	9.3	2.9	.6	2.3	.6	1.2	-----	-----	-----
Scarlet fever (8)	196	100	21.4	13.3	13.8	8.2	6.1	12.7	6.6	12.2	3.6	2.0	-----
Diphtheria (10)	61	100	11.5	11.5	13.1	9.8	8.2	18.0	6.6	16.4	1.6	3.3	-----
Malaria fever (5)	93	100	35.5	19.4	18.3	5.4	4.3	4.3	1.1	6.5	4.3	-----	1.1
Local and other infections not specified as accidental (41)	193	100	29.5	19.7	15.0	7.8	4.1	8.8	3.1	6.7	3.1	1.0	1.0
Smallpox vaccination (pt. 42)	74	100	41.9	39.2	5.4	5.4	2.7	1.4	1.4	1.4	1.4	-----	-----
Ear and mastoid diseases:													
Earache (pt. 86)	86	100	67.4	19.8	5.8	2.3	1.2	1.2	2.3	-----	-----	-----	-----
Otitis media (pt. 86)	374	100	30.7	17.6	16.3	8.6	4.8	7.2	5.9	5.3	3.2	-----	.3
Other ear diseases (pt. 86)	140	100	48.6	15.7	12.9	2.1	2.1	6.4	1.4	3.6	2.9	3.6	.7
Diseases of mastoid process (pt. 86)	38	100	13.2	10.5	18.4	2.6	7.9	2.6	5.3	18.4	5.3	10.5	5.3
Nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis:													
Nervousness (pt. 84)	196	100	42.3	19.4	9.2	4.1	4.1	5.6	3.1	6.1	2.6	3.1	.5
Neurasthenia, nervous breakdown (pt. 84)	98	100	18.4	9.2	16.3	8.2	6.1	12.2	8.2	9.2	6.1	3.1	3.1
Convulsions, unqualified (79, 80)	36	100	44.4	25.0	16.7	-----	-----	11.1	-----	-----	-----	-----	2.8
Other nervous diseases except cerebral hemorrhage, paralysis, neuralgia, and neuritis (70-73, 76-78, 81, pt. 84)	82	100	29.3	17.1	9.8	7.3	1.2	11.0	2.4	8.5	3.7	3.7	6.1
Rheumatism and related diseases:													
Acute rheumatic fever (51)	29	100	20.7	13.8	6.9	13.8	-----	10.3	10.3	3.4	6.9	6.9	6.9
Chronic rheumatism and arthritis (pt. 52)	106	100	16.0	14.2	7.5	10.4	8.5	4.7	3.8	12.3	4.7	8.5	9.4
Rheumatism, unqualified (pt. 52)	176	100	34.1	20.5	17.0	9.7	2.3	4.5	3.4	4.5	2.3	1.1	.6
Neuralgia and neuritis (82)	193	100	36.8	19.7	8.3	5.7	4.7	6.2	4.1	5.7	2.6	4.1	2.1
Lumbago (pt. 158)	104	100	43.3	28.8	5.8	5.8	2.9	5.8	2.9	3.8	-----	1.0	-----
Myalgia and myositis (pt. 158)	32	100	50.0	18.7	6.3	6.3	3.1	3.1	3.1	3.1	3.1	3.1	-----
Degenerative diseases:													
Cancer, all sites (43-49)	38	100	7.9	13.2	7.9	7.9	2.6	5.3	2.6	7.9	7.9	15.8	21.1
Benign tumors, except of female organs (50)	106	100	22.6	27.4	16.0	9.4	7.5	1.9	6.6	5.7	-----	.9	1.9
Diabetes (57)	50	100	20.0	6.0	10.0	6.0	6.0	8.0	12.0	10.0	4.0	14.0	4.0
Diseases of the heart (87-90)	180	100	27.2	15.6	7.8	8.3	2.8	7.2	7.2	7.8	5.0	5.6	5.6
Arteriosclerosis and high blood pressure (pt. 91, pt. 96)	107	100	24.3	14.0	4.7	7.5	5.6	15.0	3.7	12.1	5.6	2.8	4.7
Varicose veins or ulcer (pt. 93)	41	100	22.0	24.4	12.2	2.4	17.1	4.9	2.4	2.4	2.4	7.3	2.4
Nephritis, acute and chronic (128, 129)	44	100	18.2	13.6	13.6	11.4	9.1	11.4	4.5	6.8	6.8	-----	4.5
Other and unspecified kidney diseases except pyelitis (pt. 131)	125	100	32.8	21.6	11.2	4.0	6.4	3.2	6.4	6.4	-----	4.8	3.2
Cystitis, and calculi of urinary passages (132, pt. 133)	126	100	32.5	19.8	11.1	6.3	4.0	10.3	7.9	3.2	2.4	1.6	.8
Other diseases of bladder (pt. 133)	58	100	46.6	13.8	10.3	8.6	3.4	10.3	1.7	3.4	1.7	-----	-----
Skin diseases:													
Furuncle (152)	237	100	32.5	21.5	15.2	6.8	6.3	2.9	3.8	7.2	1.7	1.3	.8
Abscesses and ulcers (153, pt. 154)	110	100	36.4	19.1	15.5	6.4	4.5	5.5	2.7	6.4	1.8	.9	.9
Impetigo (pt. 154)	108	100	55.6	15.7	11.1	4.6	.9	7.4	-----	2.8	-----	.9	.9
Urticaria, hives (pt. 154)	54	100	63.0	13.0	9.3	3.7	3.7	1.9	-----	1.9	1.9	-----	1.9
Scabies (pt. 154)	72	100	55.6	15.3	6.9	13.9	-----	1.4	1.4	2.8	-----	2.8	-----
Eczema (pt. 154)	133	100	39.1	15.0	12.8	5.3	4.5	4.5	4.5	8.3	2.3	2.3	1.5
Other and ill-defined skin diseases (151, pt. 154, pt. 205)	372	100	41.7	19.1	11.3	5.6	3.8	5.1	3.0	5.4	1.6	2.2	1.3

TABLE 5.—*Distribution of illnesses from specific causes according to the number of calls by all practitioners within the year of observation—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued

(Sole diagnosis only)

Diagnosis and International List numbers, 1920 revision	Attended cases with known number of calls		Percent of attended cases with the specified number of calls										
	Number	Percent	1	2	3	4	5	6–7	8–9	10–14	15–19	20–29	30 and over
Female genital and puerperal diagnoses:													
Cysts and tumors of ovary and uterus (137, 139)	33	100	15.2	12.1	9.1	15.2	12.1	----	12.1	3.0	9.1	6.1	6.1
Menstrual disorders (140, pt. 141)	177	100	44.6	16.9	11.9	7.9	2.3	3.9	2.3	5.1	2.3	1.1	1.7
Other and ill-defined nonvenereal diseases of female organs (except salpingitis), including chronic results of childbirth (pt. 141, 142, pt. 145, pt. 149)	216	100	22.7	15.7	11.6	9.3	7.9	8.8	5.1	8.8	4.6	3.2	2.8
Acute complications of pregnancy and childbirth (pt. 143, 144, pt. 145, 146–148, pt. 149)	34	100	35.3	14.7	8.8	----	5.9	11.8	----	14.7	2.9	2.9	2.9
Abortions, miscarriages, and stillbirths (pt. 143)	126	100	11.1	18.3	22.2	10.3	7.1	12.7	5.6	6.3	4.0	1.6	.8
Live births (pt. 145, pt. 149)	687	100	4.4	8.2	9.0	9.2	8.9	15.1	13.7	17.3	9.0	4.5	.7
Puerperal diseases of the breast (150)	33	100	48.5	21.2	6.1	3.0	3.0	----	3.0	6.1	-----	6.1	3.0
Accidental injuries:													
Poisoning by ivy, oak, and other plants (pt. 177)	67	100	64.2	17.9	4.5	1.5	6.0	6.0	----	-----	-----	-----	-----
Other accidental poisonings (175, 176, pt. 177)	99	100	52.5	27.3	8.1	8.1	2.0	1.0	----	-----	1.0	-----	-----
Automobile accidents (pt. 188)	158	100	24.1	12.7	12.0	11.4	5.1	12.7	4.4	4.4	4.4	4.4	4.4
Accidental burns (179)	96	100	12.7	13.5	7.3	8.3	5.2	2.1	8.3	5.2	-----	7.3	-----
Accidental injuries by cutting or piercing instruments (184)	246	100	37.4	19.5	8.5	10.6	5.7	7.7	3.7	2.4	2.0	1.2	1.2
Accidental falls (185)	171	100	48.5	15.2	10.5	4.1	1.8	8.8	5.8	2.9	1.2	1.2	-----
Eye accidents (pt. 85, pt. 202)	111	100	57.7	10.8	9.9	10.8	.9	.9	1.8	2.7	1.8	1.8	.9
Injuries by animals (189)	44	100	52.3	11.4	9.1	9.1	2.3	2.3	4.5	2.3	6.8	-----	-----
All other accidents (165–174, 178, 180-183, 186, 187, pt. 188, 190–200, 201, pt. 202)	1,467	100	33.3	19.5	11.6	8.0	6.1	8.9	3.1	4.6	2.2	1.3	1.4
All other diseases:													
Anemia, all forms (58)	104	100	22.1	11.5	2.9	10.6	2.9	11.5	6.7	15.4	4.8	7.7	3.8
Diseases of thyroid gland (60)	99	100	16.2	15.2	10.1	10.1	8.1	5.1	10.1	8.1	3.0	6.1	8.1
Acidosis (pt. 69)	59	100	45.8	25.4	13.6	3.4	3.4	1.7	5.1	1.7	-----	-----	-----
Sty (pt. 85)	46	100	56.5	15.2	10.9	6.5	6.5	2.2	----	-----	-----	2.2	-----
Conjunctivitis, pinkeye, sore eye (pt. 85)	137	100	58.4	19.0	6.6	4.4	3.6	5.1	1.5	1.5	-----	-----	-----
Other eye diseases (pt. 85)	136	100	30.9	20.6	11.8	3.7	4.4	8.1	2.2	8.1	3.7	2.9	3.7
Hemorrhoids (pt. 93)	81	100	43.2	16.0	7.4	2.5	6.2	7.4	4.9	11.1	-----	1.2	-----
Diseases of lymphatic system (94)	144	100	34.7	21.5	11.1	8.3	2.8	6.3	4.2	6.9	.7	2.1	1.4
Diseases of the teeth and gums (pt. 108)	152	100	63.8	21.7	7.2	4.6	2.0	----	----	.7	-----	-----	-----
Pyelitis (pt. 131)	79	100	19.0	26.6	12.7	2.5	5.1	11.4	8.9	5.1	2.5	2.5	3.8
Circumcision (pt. 136)	53	100	34.0	32.1	20.8	5.7	1.9	3.8	1.9	-----	-----	-----	-----
Diseases of bones and joints, except tuberculosis and rheumatism (155, 156)	63	100	22.2	11.1	7.9	7.9	6.3	6.3	4.8	12.7	6.3	7.9	6.3
Ill-defined orthopedic conditions and diseases of the organs of locomotion, except lumbago, myalgia and myositis (157, pt. 158, pt. 205)	137	100	21.9	19.0	10.2	6.6	5.8	8.0	5.8	10.2	4.4	3.6	4.4
Congenital malformations and diseases of early infancy (159–163)	49	100	40.8	16.3	2.0	6.1	8.2	10.2	----	10.2	-----	2.0	4.1
Headache (pt. 205)	104	100	60.6	17.3	8.7	3.8	3.8	1.9	1.9	1.0	-----	1.0	-----
Backache (pt. 205)	80	100	37.5	12.5	13.7	6.3	3.7	6.3	3.7	12.5	-----	2.5	1.3
Debility, fatigue, exhaustion, malnutrition, loss of weight (pt. 205)	171	100	41.5	17.0	11.7	8.2	4.1	4.1	4.1	4.7	2.9	1.8	-----
Rash, unqualified (pt. 205)	82	100	68.3	23.2	2.4	2.4	1.2	1.2	1.2	-----	-----	-----	-----

Of the 104 diagnoses (sole causes) for which distributions of cases according to total calls are shown in table 5, 49 diagnoses had 40 percent or more of the cases with only one call, 69 had 30 percent or more, and 89 diagnoses had 20 percent or more of the cases with only one call. At the other extreme, there were 31 diagnoses in which less than 5 percent of the cases had 10 or more calls, 51 in which less than 10 percent of the cases had 10 or more calls, and 72 diagnoses in which less than 15 percent of the cases had 10 or more calls. The 8 specific diagnoses with the largest percentages of cases with 10 or more calls by all practitioners were cancer, 53 percent; respiratory tuberculosis, 39 percent; mastoid diseases, 39 percent; hay fever, 37 percent; chronic rheumatism and arthritis, 35 percent; diseases of the bones and joints, 33 percent; pneumonia, 33 percent; and diabetes, 32 percent.

IV. SUMMARY

Data on the frequency of illness and the volume of medical care received were recorded for a 12-month period between 1928 and 1931 by periodic canvasses of 8,758 white families in 130 localities in 18 States. The families included representation from nearly all geographic sections, from rural, urban, and metropolitan areas, from all income classes, and of both native- and foreign-born persons. The visits were made at intervals of 2 to 4 months. Illness causing symptoms that lasted for one day or longer within the study year was recorded, together with the number of calls on the case by physicians in general practice, specialists, public and private clinic physicians, osteopaths, chiropractors, chiropodists, and other types of practitioners.

There were 3.3 calls by all practitioners per total case (attended or not attended), and 4.2 calls per attended case of illness from all causes; 78 percent of the cases had one or more calls by some practitioner. For 13 broad diagnosis groups, the mean calls per attended case of sole or primary diagnosis ranged from 2.4 for minor respiratory and minor digestive diseases to 8.1 calls for degenerative diseases. The specific diseases with the largest average calls per attended case with sole diagnosis were typhoid fever, 20; cancer, 19; and cerebral hemorrhage and paralysis, 16 calls. Of the 113 diagnoses, 67 had less than 5 calls per attended case with sole diagnosis; and 11 diagnoses had 10 or more calls per attended case.

Of all attended illnesses, 12.8 percent were attended by specialists, 4.8 by public clinics, and 4.3 by nonmedical practitioners; 96 percent of the attended cases had the attendance of one or more medical doctors with or without nonmedical practitioners. Of the total calls, 14.3 percent were made by specialists, 4.7 were to public clinics, and 8.7 percent were made by nonmedical practitioners; 91 percent of all

calls were made by medical doctors. Of the illnesses attended by general medical practitioners, 57 percent had one or more home calls.

Among 13 broad diagnosis groups, ear and mastoid diseases had the highest percentage of attended cases (sole or primary causes) with a specialist, 43 percent; major respiratory diseases was second with 37 percent. Of the 113 specific diagnoses (sole causes), 58 showed specialists in 10 percent or more of the cases. The specific diagnoses with the highest percentages of cases attended by specialists were mastoid diseases, 72 percent; miscellaneous eye diseases (except sty and conjunctivitis), 57 percent; and miscellaneous ear diseases (except otitis media and earache), 54 percent.

Among the 13 diagnosis groups (sole or primary causes) the highest proportions of patients that attended public clinics were for major respiratory diseases, 10.9 percent, and female genital and puerperal diagnoses, 8.4 percent. Of the 113 specific diagnoses (sole causes), 12 showed attendance at public clinics by 10 percent or more of the patients. The specific diagnoses with the highest percentages of patients attending public clinics were: Respiratory tuberculosis, 49 percent; suspected tuberculosis, 47 percent; and sickness following smallpox vaccination, 30 percent.

Of the 13 diagnosis groups (sole or primary causes), the ones with the highest proportions attended by nonmedical practitioners were rheumatism and related diseases, 19 percent, and nervous diseases, 12 percent. Of the 113 specific diagnoses (sole causes), 17 had a nonmedical attendant in 10 percent or more of the cases. The specific diagnoses with the highest percentages of cases attended by nonmedical practitioners were foot trouble, 99 percent; backache, 60 percent; and myalgia and myositis, 56 percent.

Complicated cases (illnesses with two or more diagnoses) almost invariably received more medical care than those with only a single diagnosis. Considering illness from all causes, cases with sole diagnosis averaged 3.9 calls per attended case, as compared with 9.3 for complicated cases. Cases of sole diagnosis had a specialist in 12 percent of the cases, as compared with 25 percent for complicated cases.

Forty percent of all attended illnesses had only a single call by a doctor; at the other extreme, 9.7 percent had 10 or more calls. Among 13 broad diagnosis groups (sole or primary causes), minor digestive diseases had the largest proportion of attended cases with a single call, 55 percent, and minor respiratory diseases was second with 50 percent. Female genital and puerperal diagnoses had the largest proportion of attended cases with 10 or more calls, 26 percent.

V. REFERENCES

Preceding Papers in this Series on 9,000 Families

(*1*) Collins, Selwyn D.: Causes of illness. Pub. Health Rep., **48**: 283–308 (Mar. 24, 1933) (Reprint 1563).
(*2*) ———: Frequency of health examinations. Pub. Health Rep., **49**: 321–346 (Mar. 9, 1934) (Reprint 1618).
(*3*) ———: Frequency of eye refractions. Pub. Health Rep., **49**: 649–666 (June 1, 1934) (Reprint 1627).
(*4*) ———: A general view of the causes of illness and death at specific ages. Pub. Health Rep., **50**: 237–255 (Feb. 22, 1935) (Reprint 1673).
(*5*) ———: Age incidence of illness and death considered in broad disease groups. Pub. Health Rep., **50**: 507–525 (Apr. 12, 1935) (Reprint 1681).
(*6*) ———: Age incidence of specific causes of illness. Pub. Health Rep., **50**: 1404–1427 (Oct. 11, 1935) (Reprint 1710).
(*7*) ———: History and frequency of smallpox vaccinations and cases. Pub. Health Rep., **51**: 443–479 (Apr. 17, 1936) (Reprint 1740).
(*8*) ———: History and frequency of typhoid fever immunizations and cases. Pub. Health Rep., **51**: 897–926 (July 10, 1936) (Reprint 1758).
(*9*) ———: History and frequency of diphtheria immunizations and cases. Pub. Health Rep., **51**: 1736–1773 (Dec. 18, 1936) (Reprint 1789).
(*10*) ———: History and frequency of clinical scarlet fever cases and of injections for artificial immunization. Pub. Health Rep., **53**: 409–427 (Mar. 18, 1938) (Reprint 1917).
(*11*) ———: Frequency of surgical procedures. Pub. Health Rep., **53**: 587–628 (Apr. 22, 1938) (Reprint 1926).
(*12*) ———: Percentage of illnesses treated surgically. Pub. Health Rep., **53**: 1593–1616 (Sept. 9, 1938) (Reprint 1981).
(*13*) ———: Frequency of dental services. Pub. Health Rep., **54**: 629–657 (Apr. 21, 1939) (Reprint 2058).
(*14*) ———: Cases and days of illness among males and females, with special reference to confinement to bed. Pub. Health Rep., **55**: 47–93 (Jan. 12, 1940) (Reprint 2129).
(*15*) ———: Duration of illness from specific diseases. Pub. Health Rep., **55**: 861–893 (May 17, 1940) (Reprint 2161).
(*16*) ———: Frequency and volume of doctors' calls among males and females. Pub. Health Rep., **55**: 1977–2020 (Nov. 1, 1940) (Reprint 2205).

Other References

(*17*) Falk, I. S., Klem, Margaret C., and Sinai, N.: The incidence of illness and receipt and costs of medical care among representative families. Publication No. 26 of the Committee on the Costs of Medical Care, University of Chicago Press, 1933.
(*18*) Pearl, Raymond: Medical Biometry and Statistics. 2nd edition. W. B. Saunders Co., Philadelphia, 1930.
(*19*) Perrott, G. St. J., Tibbitts, Clark, and Britten, R. H.: The National Health Survey; scope and method of the Nation-wide canvass of sickness in relation to its social and economic setting. Pub. Health Rep., **54**: 1663–1687 (Sept. 15, 1939) (Reprint 2098).

ORNITHODOROS HERMSI AND RELAPSING FEVER IN OREGON [1]

By Gordon E. Davis, *Bacteriologist, United States Public Health Service*

The first proved case of relapsing fever in Oregon occurred near Bend in Deschutes County, central Oregon, in June 1940, and has recently been reported in detail by Hemingway, Hemingway, and Arneson of that city. Following the finding of spirochetes in blood films, a blood sample and a film were forwarded to the Rocky Mountain Laboratory for confirmation of the diagnosis. A small clot from the blood sample was washed, ground in saline, and injected into two white mice. One mouse died the following day. Spirochetes appeared in tail blood of the remaining mouse on the eleventh and twelfth days following injection and were present in the forwarded film.

Later in the summer a second authentic case from the same general locality was reported by these same physicians, who further advised that three probable cases have occurred near Bend during the past several years.

These data indicated a new endemic area quite distant from previously known foci. Local observations were made by the writer in early October in an attempt to determine the transmitting agent. Only one collection of ticks was made. This was a lot of 52 *Ornithodoros hermsi* found in a hollow yellow pine log (*Pinus ponderosa*) a short distance southeast of Bend. Several other pine logs, 3 mouse nests, 4 "wood rat" nesting places in decaying junipers, and several ground squirrel (*Citellus* sp.) burrows failed to yield further specimens. The ticks were later tested in 7 groups of 5 each, and 3 of 4, 6, and 7 each, by allowing them to feed on white mice. Spirochetes were recovered from 6 of the 10 mice. Three of the strains were particularly invasive, spirochetes appearing in tail blood on the third day following tick feeding and rapidly increasing in number until a massive spirochetosis was attained on the sixth and seventh days. In the other three mice the course of infection was milder. Relapses occurred as shown by the disappearance and subsequent reappearance of spirochetes.

DISCUSSION

Relapsing fever has been reported from all of the neighboring States, viz, California, as early as 1921; Washington, 1927; Nevada, 1930; and Idaho, 1931.

Ornithodoros hermsi is a proved vector of relapsing fever in California (Wheeler, Herms, and Meyer, 1935), Colorado (Davis, 1939), and Idaho (Philip and Davis, 1940). It is also undoubtedly a vector

[1] Contribution from the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

in the Lake Tahoe region in Nevada, a specimen of this tick collected from a summer home on the Nevada side of the lake having been sent recently to the Rocky Mountain Laboratory by Dr. Edward Records, of the University of Nevada. He advised that several years ago practically the entire family living in this dwelling had contracted relapsing fever.

This tick has been collected only in timbered regions and mostly at relatively high altitudes. In California it has been found only above 5,000 feet, in Colorado at an elevation of approximately 8,000 feet, and in Idaho at about 3,000 feet. The altitude at Bend is 3,640 feet.

In California and Idaho it has been reported chiefly from summer cabins and in Colorado only from Douglas fir (*Pseudotsuga taxifolia*) snags.[2] In most instances the number of ticks collected has been very small. However, collections from 7 snags in Park and Boulder Counties, Colo. (Davis, unpublished notes), were of 21, 30, 37, 72, 93, 213, and 318 ticks, respectively. Forty-two of the 93 ticks from one of the snags were collected nearly a year after a first collection of 51 at which time the snag was denuded of all bark and all nesting material was removed. Douglas fir checks in the process of decay, leaving many cracks and crevices in which the ticks find protection.

The new endemic area in Oregon is in a heavily timbered section. Junipers are found to the north of the city while yellow pine predominates to the south and southeast.

The area where the *O. hermsi* were found had long since been cut over, leaving numerous stumps, discarded logs, and snags. The following rodents were seen: Cottontail rabbits (*Sylvilagus* sp.), chipmunks (*Eutamias* sp.), and mantled ground squirrels (*Citellus* sp.).

The rather scanty evidence available suggests that one possible source for acquiring relapsing fever in this area may be through direct or indirect contacts with wood, in one way or another. The 52 *O. hermsi* collected locally were found clinging to debris in a hollow yellow pine log and the appearance of the log suggested that rodent nesting material might have been present in that portion of the bole that had been removed (the stump was not decayed) and that ticks might have been carried away in it. Nearby a boy was observed gathering wood from fallen pines. In other words, such biotopes may serve as "reservoirs" from which a few ticks may occasionally be transported on rodents or by other means to nearby cabins or dwellings.

Neither of the two proved cases had any known contact with rodents. The second patient stated that, in connection with his duties in a sawmill, he often stood "hip deep" in shavings of shredded

[2] This term is in common usage for that portion of a tree which remains after the top has been *blown* down and is in contrast to a "stump" which is that portion remaining after a tree has been *cut* down.

pine. Such shavings might occasionally come from a log such as mentioned in the preceding paragraph. A small pile of lumber on this man's ranch contained boards that had probably been cut from a log that was partially hollow.

The only known records of *Ornithodoros* ticks, other than *hermsi*, in Oregon are 15 nymphs of *O. parkeri* recovered from a lot of 12 ground squirrels (*Cit. columbianus*) collected in Umatilla County, Oreg., and Walla Walla County, Wash., in May 1939 (forwarded to this laboratory by Professor C. Anderson Hubbard of Pacific University) and 1 nymph collected from a woodchuck in Benton County west of the Cascade Mountains in 1935 (recently forwarded by S. E. Crumb, Jr.).

It appears reasonably certain that, since Bend is in a timbered area and spirochete-infected *O. hermsi* were collected locally, this tick is in fact the local vector. *O. parkeri* has been collected only on sagebrush prairies, grassy slopes, or semidesert areas, never in timbered regions.

SUMMARY

Two proved cases and three suspected cases of relapsing fever have been reported from central Oregon. Fifty-two specimens of *Ornithodoros hermsi* were collected from a hollow pine log in the immediate area. These were tested in 7 groups of 5 each, and 3 groups of 4, 6, and 7 each. Spirochetes were recovered from 6 of the 10 test mice. The presence of relatively large numbers of *O. hermsi* in Douglas firs in Colorado and in a pine log in Oregon suggests such habitats as the source of infestations of cabins and nearby dwellings and, further, that contact with decaying wood as a fuel or lumber supply may be a source of infection.

REFERENCES

(*1*) Briggs, L. H.: Relapsing fever in California. J. Am. Med. Assoc., **79**: 941–44 (1922).

(*2*) Davis, Gordon E.: Relapsing fever: *Ornithodoros hermsi* a vector in Colorado. Pub. Health Rep., **54**: 2178–2180 (1939).

(*3*) Davis, Gordon E.: *Ornithodoros parkeri* Cooley: Observations on the biology of this tick. J. Parasitol., in press.

(*4*) Hemingway, M. W., Hemingway, R. W., and Arneson, V. K.: Relapsing fever. Northwest Medicine, **39**: 362–64 (1940).

(*5*) Magee, George R.: Relapsing fever case reports. Presented before the Nevada Medical Society (1930).

(*6*) Philip, Cornelius B., and Davis, Gordon E.: Relapsing fever: Data implicating *Ornithodoros hermsi* as a vector in northern Idaho. Pub. Health Rep., **55**: 504–507 (1940).

(*7*) Tollefsen, A. D.: Relapsing fever. Med. Bull. Vet. Admin., **12**: 84–85 (1935).

(*8*) Wheeler, C. M., Herms, W. B., and Meyer, K. F.: A new tick vector of relapsing fever in California. Proc. Soc. Exp. Biol. and Med., **32**: 1290–92 (1935).

PROVISIONAL MORTALITY RATES FOR THE FIRST HALF OF 1941

The mortality rates in this report are based upon preliminary data from 32 States, the District of Columbia, Alaska, and Hawaii for the first 6 months of 1941. Comparative data for the first 6 months of 1939 and 1940 are presented for 25 States and the District of Columbia. This report is made possible through a cooperative arrangement

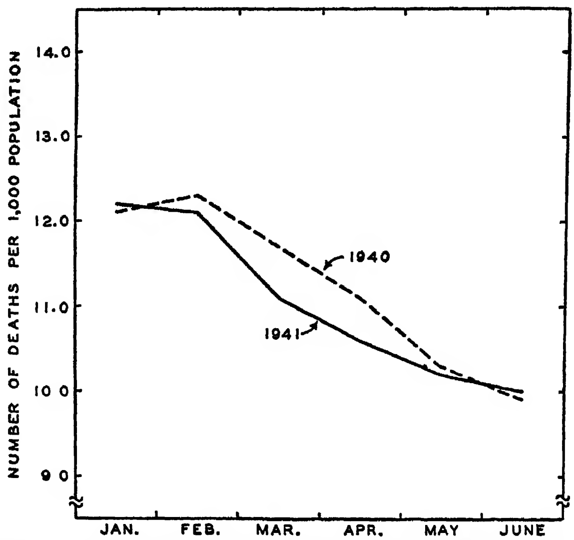


FIGURE 1.—Death rates per 1,000 population, by months, 1941 and 1940.

with the respective States which voluntarily furnish provisional monthly tabulations of current birth and death statistics to the United States Public Health Service which analyzes and publishes the data. Because of lack of uniformity in the method of classifying deaths according to cause, as well as some delay in filing certificates, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census.

In the past, however, these preliminary reports have accurately reflected the trend in mortality rates for the country as a whole. Some deviation from the final figures, especially those for specific causes of death, for individual States may be expected because of the provisional nature of the information. Nevertheless, it is believed that the trend in mortality within each State is correctly represented. Comparisons of specific causes of death for different States are subject to error because of variations in tabulation procedure and promptness of filing the original certificates. Such comparisons should be based upon the final figures published by the Bureau of the Census.

The mortality rate from all causes per 1,000 population for the first half of 1941 was slightly lower than the corresponding rate for the 2 previous years, 11.1 compared with 11.3 in each of the 2 preceding years. During the current year, the death rate has been lower than last year for 4 of the first 6 months (fig. 1). The slight decrease results from decreases in mortality from pneumonia and from certain of the chronic diseases of late adult life, cerebral hemorrhage, heart disorders, and nephritis. In addition, there were decreases in the mortality rates of diphtheria, scarlet fever, and diseases of the digestive system.

The current period was marked by widespread outbreaks of influenza and measles; in 1941, 22 of the reporting areas experienced a higher influenza rate and 20 of the reporting areas experienced a higher measles rate than in 1940. The influenza rate was 20 percent higher than the rate in 1940, and the measles rate was over 6 times as high. Mortality rates from cancer and tuberculosis showed very slight increases, the latter remaining well below 50 per 100,000, while the diabetes rate was the same as in 1940.

The increase in the death rate from accidents which was recorded in 1940 continued throughout the first 6 months of 1941, the rate being 4 percent higher in 1941 than in 1940. Fatal automobile accidents showed an increase of 18 percent.

Infant deaths per 1,000 live births for the first 6 months of 1941 showed no change from the corresponding rate for 1940. Maternal mortality, however, continued to show a decided decrease. The rate of 3.1 maternal deaths per 1,000 live births was 20 percent less than in the preceding year.

The birth rate increased from 16.6 per 1,000 population in 1940 to 17.4 in 1941. The crude rate of natural increase was 6.3 per 1,000 population, as compared with 5.3 and 5.2 for the first 6 months of 1940 and 1939.

Provisional mortality from certain causes in the first 6 months of 1941, with comparative provisional data for the corresponding period in preceding years

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																			
			Total infant mortality	Maternal mortality	Typhoid fever (1–2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13–22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45–55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis under 2 years (119)	Nephritis, all forms (130–132)	All accidents, including automobile accidents (169–195)	Automobile accidents (170a, b, c)
26 STATES [1]																								
January–June:																								
1941	11.1	17.4	47	3.1	0.4	0.5	0.5	2.9	0.5	47.5	24.1	2.6	0.3	0.5	121.8	29.9	93.8	322.2	60.0	50.7	3.8	77.4	68.4	23.8
1940	11.3	16.6	47	3.9	.5	.6	.7	1.8	.8	47.4	20.0	.4	.2	.6	121.0	29.9	97.2	324.2	66.6	53.7	3.8	83.1	65.5	20.2
1939	11.3	16.5	50	4.0	.7	.6	1.0	2.3	1.2	48.9	24.6	1.1	.1	.5	118.9	29.1	92.6	306.7	78.4	57.2	5.1	77.8	64.3	13.8
January–March:																								
1941	11.9	17.1	51	3.0	.4	.6	.5	2.9	.7	47.5	40.6	1.6	.3	.5	121.4	32.5	98.9	348.7	80.2	50.7	3.3	82.7	67.0	23.3
1940	12.1	16.2	51	3.9	.5	.7	.9	1.9	1.2	47.1	30.1	.4	.3	.6	122.1	32.7	103.9	347.9	86.3	54.2	3.4	88.3	65.9	19.3
1939	12.1	16.5	55	4.0	.6	.8	1.2	2.4	1.7	48.7	33.5	1.2	.1	.6	119.8	31.5	98.7	330.7	106.4	56.7	4.5	82.9	63.3	18.5
April–June:																								
1941	10.3	17.7	43	3.2	.5	.5	.4	2.9	.4	47.5	7.9	3.6	.2	.5	122.2	27.4	88.7	296.1	40.0	50.8	4.2	72.2	69.2	24.2
1940	10.5	17.0	44	3.9	.6	.6	.5	1.8	.5	47.7	9.8	.4	.2	.7	119.9	27.1	90.6	300.5	46.9	53.3	4.1	77.8	65.1	21.1
1939	10.4	16.4	45	3.9	.8	.5	.7	2.2	.6	49.1	15.8	1.1	.2	.4	118.0	26.8	86.6	283.0	50.8	56.8	5.7	72.8	65.3	19.0
Metropolitan Life Insurance Co., industrial policy-holders (January–June): [2]																								
1941	8.0	-----	-----	-----	.5	-----	.6	1.4	.6	44.8	12.8	1.3	-----	-----	104.9	30.3	64.3	[3] 227.4	40.9	-----	[4] 2.6	[5] 56.0	47.3	19.3
1940	8.1	-----	-----	-----	.4	-----	.7	1.3	.9	46.4	11.8	.4	-----	-----	102.4	31.3	63.9	[3] 225.9	47.1	-----	[4] 3.7	[5] 60.9	42.4	15.3
1939	8.2	-----	-----	-----	.5	-----	1.0	1.9	1.2	47.4	15.6	1.0	-----	-----	100.6	29.1	63.5	[3] 223.4	60.5	-----	[4] 5.7	[5] 55.4	56.9	15.5
Alaska:																								
1941	20.8	28.4	121	5.9	5.4	2.7	(6)	10.8	(6)	498.8	102.4	86.3	5.4	(6)	83.6	8.1	91.7	186.0	153.7	45.8	(6)	37.7	169.8	(6)
1940	20.2	26.1	156	2.1	(6)	(6)	(6)	43.8	8.2	440.5	8.2	246.2	(6)	(6)	79.3	(6)	93.0	232.6	175.1	19.2	5.5	16.4	136.8	(6)
1939	15.0	21.3	76	2.6	(6)	(6)	16.8	30.7	2.8	343.5	27.9	(6)	(6)	2.8	75.4	5.6	64.2	198.3	139.7	41.9	(6)	27.9	128.5	(6)

See footnotes at end of table.

Provisional mortality from certain causes in the first 6 months of 1941, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1-2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13-22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45-55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis under 2 years (119)	Nephritis, all forms (130-132)	All accidents, including automobile accidents (169-195)	Automobile accidents (170a, b, c)
Colorado:																								
1941	10.9	18.4	52	3.1	0.9	0.7	1.1	5.7	1.6	52.9	30.6	2.1	0.7	0.7	110.5	14.4	82.2	286.9	70.5	62.2	4.8	82.1	68.4	23.6
1940	11.2	19.2	51	3.4	.7	.5	.5	2.7	1.6	51.8	16.1	2.0	1.1	.4	121.3	17.9	83.6	268.7	86.5	62.7	2.1	77.2	78.2	23.6
1939	11.7	18.3	59	5.7	1.1	.9	1.4	7.0	3.1	59.6	30.9	2.2	.5	.4	114.4	17.3	92.3	250.2	110.4	63.1	4.5	83.7	77.5	21.1
Connecticut:																								
1941	9.6	12.3	36	3.2	.2	.2	.2	.4	(6)	34.5	8.1	.1	.1	(6)	131.7	35.0	84.2	333.4	37.0	45.2	1.8	69.3	53.5	17.3
1940	10.7	12.4	42	3.0	.1	(6)	(6)	.4	.2	34.6	6.6	.2	.2	.5	148.6	22.1	119.3	331.3	55.9	45.1	1.8	66.1	55.6	16.4
1939	10.7	13.1	39	3.4	.2	(6)	.4	1.5	.6	40.2	8.3	.8	(6)	.1	140.9	31.3	91.0	290.0	64.3	50.6	1.9	84.8	57.0	16.5
Delaware:																								
1941	12.6	18.2	46	(6)	(6)	(6)	1.5	3.7	(6)	55.9	20.9	3.0	(6)	(6)	121.6	27.6	106.6	391.5	68.6	50.0	5.2	144.7	63.4	23.9
1940	12.7	16.3	56	5.5	(6)	.8	2.3	3.0	(6)	50.4	18.1	(6)	(6)	(6)	142.9	33.1	109.8	377.7	72.2	46.6	4.5	136.9	55.7	21.1
1939	13.0	15.9	49	4.8	(6)	2.3	.8	2.3	1.5	64.1	17.6	(6)	(6)	2.3	122.9	36.6	122.1	409.9	101.5	47.3	3.8	120.6	62.6	23.7
District of Columbia:																								
1941	13.6	26.0	48	2.6	.3	1.2	(6)	2.4	.6	68.7	7.5	.6	.3	(6)	166.9	29.5	101.2	351.9	93.4	74.4	8.1	113.9	77.7	22.9
1940	13.7	21.2	48	2.0	.6	.9	.3	1.8	.3	67.2	11.7	(6)	.6	(6)	151.2	33.7	100.6	361.8	98.8	81.3	7.5	133.8	64.2	19.9
1939	13.2	20.8	44	5.5	.3	.9	(6)	1.9	.6	69.9	14.0	.6	(6)	.3	156.8	26.4	82.0	357.1	84.5	72.3	5.6	114.6	76.1	20.2
Florida:																								
1941	13.0	17.0	59	7.0	1.3	.8	.1	1.8	.9	48.4	46.0	1.5	1.8	.5	106.7	22.9	125.6	326.1	59.6	71.2	8.3	94.6	121.9	41.0
1940	13.2	15.3	60	7.8	1.1	.4	.1	2.0	.9	54.8	44.7	.6	.2	.4	98.7	20.8	124.5	334.5	69.1	72.3	6.9	96.0	99.2	38.8
1939	11.8	15.2	65	6.3	1.5	.5	.3	3.9	1.4	52.1	32.3	1.2	.1	.2	95.3	21.8	98.2	257.3	60.7	79.3	12.6	96.6	95.4	37.4
Georgia:																								
1941	10.2	19.8	65	4.0	.5	.5	.3	4.5	1.0	44.1	55.4	7.5	.5	.1	61.2	13.2	98.4	190.8	66.9	48.7	9.0	103.7	65.5	26.2
1940	10.3	18.9	61	5.4	.7	.4	.4	2.8	1.5	49.7	47.9	1.0	.3	.1	59.4	11.3	98.0	198.5	83.7	36.0	6.2	103.3	59.2	20.0
1939	9.7	18.4	67	6.1	1.4	.4	.3	4.4	1.3	44.5	40.7	2.9	.3	.1	56.6	11.9	90.1	163.6	83.9	54.0	12.1	91.2	52.7	18.5
Hawaii:																								
1941	7.2	22.2	47	1.9	1.4	(6)	(6)	1.9	.9	53.0	2.8	2.3	.5	.5	80.7	16.9	53.9	127.1	44.6	43.6	12.7	53.9	70.3	19.2
1940	7.4	22.3	49	2.3	2.9	.5	(6)	2.4	2.4	64.1	6.2	(6)	1.9	(6)	67.5	15.7	43.7	116.9	48.5	47.5	6.7	62.2	52.3	11.9
1939	8.0	20.3	62	3.3	1.9	(6)	(6)	7.8	1.5	69.9	5.8	(6)	(6)	.5	66.9	18.9	46.1	134.9	68.4	55.3	11.2	74.2	51.4	13.6

Idaho:																								
1941	8.5	22.5	39	2.0	1.1	.8	.8	5.3	(6)	14.3	17.7	.4	(6)	1.1	84.4	20.7	76.5	213.6	37.3	46.7	1.5	58.4	77.6	23.7
1940	9.2	22.1	36	4.0	.4	1.5	1.1	1.5	.4	21.0	17.2	1.5	(6)	1.5	88.5	16.8	63.3	241.6	39.3	55.0	3.8	58.4	87.0	27.5
1939	9.6	21.5	48	2.7	2.7	1.9	.8	2.3	.8	20.6	21.8	1.6	.4	1.2	92.2	24.5	65.3	258.2	73.9	54.8	2.7	50.6	83.2	25.3
Illinois:[7]																								
1941	11.2	14.8	39	2.8	.2	.2	.8	1.0	.8	47.2	11.8	2.0	(8)	.3	146.6	32.0	83.4	370.1	54.5	57.3	1.8	96.1	66.8	26.4
1940	12.0	14.2	39	3.0	.3	.2	1.4	.8	1.2	47.7	15.1	.2	(8)	.3	139.8	37.6	90.4	387.2	64.3	59.7	1.6	99.9	66.2	24.9
1939	12.1	14.1	44	3.4	.2	.2	1.5	2.6	1.8	49.8	25.5	.1	.2	.3	141.9	32.1	81.5	379.5	81.4	60.7	2.1	105.9	62.7	23.2
Indiana:																								
1941	11.7	16.3	43	2.9	.5	.7	.9	1.8	1.0	39.6	32.5	2.7	.1	.1	121.4	15.6	143.7	294.9	60.8	(9)	2.0	68.4	85.6	36.4
1940	12.2	16.1	46	3.5	.4	.2	1.5	2.8	.8	40.0	34.4	.1	.1	.5	122.7	17.4	151.8	340.2	76.0	(9)	2.8	56.4	74.3	25.8
1939	12.0	15.5	45	4.4	1.0	.5	2.1	1.5	1.5	43.4	45.3	.2	(6)	.7	114.3	17.4	141.5	268.3	97.1	(9)	3.4	66.6	66.9	24.4
Iowa:																								
1941	10.0	17.0	39	2.7	.2	.3	.6	1.7	.3	13.9	21.1	.9	.1	.3	129.2	26.5	105.1	297.3	52.5	46.8	1.3	62.7	57.4	18.4
1940	10.6	15.5	42	4.1	.2	.7	.9	.6	.9	17.4	26.6	.7	.5	1.1	135.0	29.0	115.7	312.4	59.0	50.9	1.6	71.9	60.6	16.5
1939	10.6	16.2	41	2.3	.6	.5	1.6	1.6	.4	18.7	41.8	1.9	.2	.5	123.6	27.9	111.8	290.9	69.7	56.2	2.2	58.9	62.9	17.1
Kansas:																								
1941	11.0	16.2	43	2.3	.1	.8	.3	4.3	.3	25.8	35.3	3.3	.1	1.0	120.0	28.1	108.5	303.3	46.5	53.1	2.0	102.6	71.8	25.9
1940	10.7	14.8	41	3.9	(6)	.7	.4	1.8	.8	24.7	29.4	1.7	(6)	1.0	124.7	27.7	107.1	291.8	44.3	54.1	2.3	105.0	71.0	21.8
1939	10.5	14.9	42	4.3	.4	.2	.8	.4	.7	25.7	27.2	.2	.1	1.5	123.4	29.0	93.3	270.5	60.4	56.2	2.2	103.4	93.0	19.4
Kentucky:																								
1941	10.9	20.0	60	4.9	1.4	1.1	1.1	8.3	1.0	76.0	65.7	8.4	.9	.1	81.0	17.1	103.2	231.0	74.4	48.3	6.2	80.0	79.9	25.0
1940	10.7	20.4	54	4.8	1.8	1.3	1.1	4.5	1.5	69.9	42.7	.8	1.0	.4	81.4	15.1	110.9	227.2	74.3	51.0	5.4	73.5	73.5	20.0
1939	10.1	20.7	45	4.1	1.8	1.6	1.4	1.4	2.5	65.9	50.7	1.9	.3	.6	74.2	12.6	97.3	211.4	85.1	49.5	8.6	66.1	61.2	18.3
Maine:																								
1941	13.4	17.6	56	2.8	.2	1.2	.2	2.6	.5	33.8	33.5	1.4	.2	.5	153.9	32.1	132.2	399.7	73.7	51.5	5.0	99.2	71.3	18.9
1940	12.3	17.2	57	4.4	.5	1.7	1.2	1.7	.9	28.7	16.1	1.7	(6)	.2	144.6	31.8	133.4	370.2	61.4	54.5	5.2	95.3	64.7	17.5
1939	13.8	17.3	57	4.6	1.4	.2	.5	4.5	3.6	34.9	32.8	.7	1.4	.2	153.1	26.8	133.7	410.7	101.9	53.6	4.1	88.0	63.9	15.1
Maryland:																								
1941	12.7	17.6	58	2.2	.4	1.2	.1	4.7	(6)	79.4	16.8	1.1	.1	.3	146.8	33.7	96.6	369.4	77.1	47.1	4.6	126.8	73.0	28.0
1940	13.1	16.3	52	3.1	.4	.6	.4	2.8	.4	84.9	13.8	.1	.2	.4	136.6	34.6	104.9	377.4	85.9	49.6	3.2	144.8	72.3	22.1
1939	12.4	15.5	52	3.5	.6	.8	.2	1.1	1.2	75.7	14.5	1.7	(6)	.6	134.4	30.4	105.1	341.3	91.0	49.9	4.6	129.2	68.4	13.2
Michigan:																								
1941	10.2	18.1	42	3.2	.1	.1	.9	1.9	.2	35.3	13.8	2.4	(6)	.1	116.3	27.7	88.8	305.5	52.0	50.0	3.0	56.5	73.5	33.4
1940	10.1	17.9	44	3.4	.2	.3	1.0	.8	.5	34.1	6.8	.4	.1	.2	115.6	28.1	90.2	311.1	53.4	55.5	4.0	55.6	67.1	28.0
1939	10.8	17.7	46	3.5	.4	.4	2.1	1.8	.6	39.0	26.3	1.1	(6)	.2	117.2	28.8	89.3	312.8	74.2	57.7	3.5	59.2	64.8	21.2
Montana:																								
1941	10.2	20.4	40	1.1	.4	.4	2.2	1.1	2.5	39.4	28.3	.4	1.4	.7	102.9	15.8	96.4	251.9	56.6	62.0	3.2	58.1	52.4	26.9
1940	10.3	20.0	41	3.9	.7	1.1	3.2	.7	.7	43.8	16.9	1.4	(6)	1.8	115.6	11.1	100.5	240.6	57.8	64.6	2.2	55.3	53.7	22.6
1939	10.9	19.2	58	3.6	1.1	.7	1.4	5.1	1.1	46.3	30.4	5.8	(6)	1.4	106.0	17.7	93.0	241.6	86.5	60.0	4.7	56.5	55.7	22.5
Nebraska:[7]																								
1941	10.0	16.2	39	2.6	.2	.6	.2	2.4	(6)	16.8	46.5	.6	.7	.6	125.9	25.1	117.4	247.8	52.1	37.8	1.3	70.5	53.0	13.5
1940	10.3	16.1	35	2.5	(6)	.5	.9	.2	.9	21.2	32.8	.2	(6)	.2	133.2	30.4	128.6	261.0	63.4	55.3	1.1	64.3	55.3	13.6
1939	9.9	16.4	34	3.8	.7	.4	1.3	.4	1.5	16.7	31.5	2.0	.2	.7	116.5	27.3	94.1	236.6	81.3	54.9	1.5	71.8	61.2	14.7
Nevada:																								
1941	(9)	17.6	42	3.0	5.4	(6)	(6)	1.8	(6)	64.4	10.7	(6)	(6)	1.8	127.0	16.1	69.8	314.9	50.1	66.2	3.6	57.3	199.7	34.1
1940	12.3	18.5	44	5.9	(6)	1.8	(6)	(6)	1.8	63.6	9.1	(6)	1.8	(6)	114.4	21.8	69.0	303.4	78.1	85.4	5.4	59.9	149.0	61.8
1939	11.4	17.0	47	2.2	(6)	(6)	(6)	(6)	(6)	53.8	9.3	3.7	(6)	(6)	115.0	7.4	81.6	295.0	111.3	46.4	(6)	49.4	141.0	46.4

See footnotes at end of table.

Provisional mortality from certain causes in the first 6 months of 1941, with comparative provisional data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths), per 1,000 population (annual basis)	Rate per 1,000 live births: Total infant mortality	Rate per 1,000 live births: Maternal mortality	Death rate per 100,000 population (annual basis): Typhoid fever (1–2)	Cerebrospinal (meningococcus) meningitis (6)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Tuberculosis, all forms (13–22)	Influenza (grippe) (33)	Measles (35)	Acute poliomyelitis and polioencephalitis (36)	Acute infectious encephalitis (lethargic) (37)	Cancer, all forms (45–55)	Diabetes mellitus (61)	Cerebral hemorrhage, embolism, and thrombosis (83a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis under 2 years (119)	Nephritis, all forms (130–132)	All accidents, including automobile accidents (169–195)	Automobile accidents (170a, b, c)
New Jersey:																								
1941	11.5	14.8	38	2.2	0.1	0.3	0.3	0.6	(5)	45.7	9.0	1.1	0.1	0.3	148.6	38.7	99.7	379.8	54.9	53.0	2.4	84.3	62.2	20.3
1940	11.3	13.6	38	2.7	.3	(6)	.7	.6	.5	45.0	6.5	.3	.1	.4	140.8	39.5	93.4	382.4	58.1	54.9	2.5	84.4	57.7	18.0
1939	11.2	13.4	43	3.1	.2	.5	.8	1.5	.5	46.6	9.8	(6)	.1	.5	138.0	37.1	89.3	376.3	65.7	57.8	3.2	75.5	55.3	17.8
New Mexico:																								
1941	10.3	27.1	85	3.7	1.8	(6)	.4	11.1	2.6	71.7	24.4	15.1	.4	.7	53.9	11.8	42.5	120.1	67.2	53.2	17.4	52.1	85.3	38.4
1940	10.4	33.1	71	4.6	1.1	(6)	(6)	10.2	1.9	80.1	16.6	.4	(6)	(6)	51.9	10.5	44.8	114.0	62.4	55.7	14.7	56.4	81.6	34.6
1939	11.7	29.4	99	5.2	1.9	1.5	.8	7.7	4.2	78.6	35.4	1.5	.4	(6)	52.4	7.3	42.3	117.5	121.0	61.3	10.4	51.2	72.0	33.1
New York:																								
1941	11.6	15.1	35	2.3	.2	.6	.3	.8	(6)	48.8	6.6	.6	(6)	.9	157.7	43.5	75.5	417.5	54.8	54.7	2.7	64.1	58.0	16.1
1940	11.8	14.3	39	3.5	.1	.4	.5	1.2	.1	49.1	4.5	.1	(6)	1.0	156.5	43.1	76.5	415.0	57.1	59.2	3.1	70.4	59.4	14.8
1939	12.1	14.2	43	3.1	.2	.6	.5	1.0	.3	51.2	6.6	.6	.1	.4	155.1	43.1	71.1	392.8	77.3	61.3	4.5	75.9	59.0	14.2
North Carolina:																								
1941	9.5	23.3	64	4.8	.6	.5	.3	6.3	1.6	50.2	46.1	4.3	.3	.4	58.9	14.3	83.9	166.7	76.0	41.0	7.7	88.8	70.2	32.5
1940	9.6	22.4	61	6.0	.5	.3	.4	2.3	2.9	52.4	37.9	.5	.2	.3	59.3	15.4	90.8	159.2	79.2	42.8	7.2	106.6	59.9	22.7
1939	9.3	21.9	63	5.5	.6	.5	.5	8.1	2.8	54.5	28.0	3.1	.1	.2	57.5	13.7	83.6	164.7	79.8	58.1	15.4	83.8	59.7	21.9
North Dakota:																								
1941	8.5	21.8	45	1.9	(6)	(6)	.6	2.2	1.6	19.9	18.0	.6	.3	1.3	88.3	20.6	74.3	214.8	46.5	49.7	3.8	45.2	65.2	13.0
1940	8.0	21.2	41	1.5	.9	(6)	1.6	2.2	1.6	18.2	13.8	.3	(6)	1.6	97.2	24.5	72.5	206.4	43.0	48.3	5.0	43.3	48.6	13.8
1939	8.6	20.8	52	3.6	.9	.9	1.6	2.5	.6	30.7	23.8	6.3	(6)	1.3	91.7	24.1	76.7	204.0	72.0	54.4	6.6	44.1	41.3	10.6
Ohio:																								
1941	11.6	15.6	43	2.8	.3	.2	.3	2.8	.2	43.8	23.6	2.8	.3	.7	136.3	31.8	108.4	331.3	55.3	51.9	3.5	78.8	83.0	29.9
1940	11.9	15.7	40	3.8	.5	.6	.8	1.7	.5	42.6	20.5	(6)	(6)	.5	136.2	31.8	117.0	334.3	67.4	52.8	3.3	82.8	82.7	24.6
1939	11.9	14.9	45	4.2	.5	.2	1.5	1.2	.9	46.7	30.3	.1	.1	.6	129.7	30.6	115.6	319.6	80.6	57.2	2.8	82.0	77.8	22.7
Oklahoma:																								
1941	9.3	19.3	56	3.1	.9	.4	.3	7.3	2.4	49.2	40.8	1.1	.5	.4	83.9	16.9	82.1	199.2	69.9	45.8	2.2	59.6	57.5	20.1
1940	9.1	17.8	48	3.6	1.5	1.4	.4	1.6	2.8	49.4	33.8	.3	1.1	.8	62.9	16.1	81.3	169.1	73.2	52.2	3.4	64.3	55.6	17.4
1939	9.5	18.1	58	4.1	2.2	.4	1.1	1.2	2.8	48.1	34.3	6.3	.4	.4	80.0	14.0	90.3	169.5	89.0	53.2	5.9	61.8	97.7	20.7

Pennsylvania:																								
1941	11.5	17.7	41	2.4	.4	.3	.4	1.6	.3	42.4	18.2	1.8	.2	.8	124.4	38.3	90.3	367.1	54.3	47.4	3.3	93.8	55.2	16.5
1940	11.8	15.4	48	2.9	.5	1.0	.6	1.3	.5	42.7	17.1	.1	.2	.6	123.0	38.5	89.4	365.4	63.2	52.5	3.7	104.9	53.6	14.3
1939	11.6	16.2	47	2.9	.7	.8	.8	1.9	.9	44.0	19.4	.2	(8)	.7	127.3	36.9	89.7	352.6	67.0	54.4	3.9	91.5	52.2	13.8
South Carolina: [7]																								
1941	10.9	21.0	88	6.3	1.6	1.5	.5	10.4	.6	44.4	67.2	8.9	.1	(6)	53.7	15.2	95.9	196.4	93.5	33.2	1.6	58.2	74.3	30.1
1940	11.1	19.9	81	7.5	1.4	.3	.1	2.5	1.8	44.6	64.4	.8	.8	.3	47.2	16.3	110.7	214.1	93.2	36.9	2.1	66.2	75.6	26.6
1939	9.7	19.1	76	6.6	2.2	.5	.3	8.8	1.8	42.7	42.8	.8	1.7	.4	48.4	14.1	94.7	183.6	86.2	26.3	2.8	85.6	57.9	23.4
Tennessee:																								
1941	10.1	17.6	60	4.0	.8	1.2	.4	6.5	.8	84.1	55.8	7.4	.3	.8	79.0	14.3	80.6	182.5	81.3	47.4	5.3	66.3	57.1	19.1
1940	10.6	16.9	59	5.6	.8	.7	.7	3.0	1.2	78.8	50.1	1.1	.1	.4	71.4	16.5	88.8	211.6	94.6	50.6	3.6	63.5	60.5	14.9
1939	9.7	15.7	59	5.5	1.5	.7	.7	3.5	1.5	79.5	50.7	1.7	.5	.7	69.2	12.8	80.6	170.8	88.0	55.2	7.7	59.3	56.1	16.0
Utah:																								
1941	8.3	24.0	31	1.1	.4	.4	(6)	2.2	(6)	12.3	15.2	(6)	(6)	.4	78.0	22.5	59.5	262.2	30.5	47.9	3.6	53.0	72.2	28.7
1940	8.9	24.5	39	2.4	.4	.7	2.2	2.9	(8)	17.1	18.6	1.5	.4	.4	91.5	17.1	55.4	256.7	41.9	51.1	2.2	54.7	75.1	27.7
1939	8.6	23.9	41	2.9	.4	1.1	.4	.7	.4	16.2	12.5	.4	(6)	.4	91.5	17.0	52.0	238.2	55.7	57.5	2.2	61.6	66.8	23.2
Vermont:																								
1941	12.0	18.2	53	2.8	6	1.7	.6	(6)	(6)	39.8	25.8	1.2	(6)	(6)	140.2	29.2	121.7	398.8	60.0	52.2	5.6	90.9	30.5	14.6
1940	11.8	18.5	35	4.5	1.1	.6	(6)	2.8	(6)	39.7	16.8	(8)	(6)	(6)	126.5	22.4	129.3	328.6	82.3	46.5	4.5	79.5	44.2	10.6
1939	12.2	15.9	38	3.5	(6)	.6	1.7	5.1	1.7	47.2	40.4	1.1	.6	.6	142.7	37.1	123.6	412.2	116.8	46.1	5.1	82.6	60.7	13.5
Virginia:																								
1941	12.0	19.9	72	4.4	.4	1.3	.3	8.9	1.2	66.2	49.9	10.6	.3	.1	82.4	21.1	108.7	276.2	79.8	43.1	5.0	106.2	88.1	32.0
1940	11.8	19.1	64	4.9	.4	1.6	.4	4.3	2.0	62.0	41.7	1.2	.3	.8	78.4	22.0	109.0	272.8	92.8	43.5	4.5	116.1	75.4	25.2
1939	11.1	18.6	68	5.6	.7	1.1	.2	5.8	2.7	64.0	33.7	1.2	.3	.3	76.7	18.7	106.9	254.8	85.9	47.0	5.8	91.5	65.5	24.0
West Virginia:																								
1941	9.1	19.6	60	3.3	.8	1.9	.8	9.0	1.2	46.7	41.6	4.5	.6	.4	72.3	18.4	83.2	176.4	64.9	38.7	3.4	63.4	75.9	21.3
1940	9.4	18.9	59	5.4	1.6	2.0	.9	4.2	2.4	48.3	28.6	(6)	.6	.3	70.7	17.4	81.2	176.1	66.9	38.4	4.6	68.6	57.1	17.3
1939	9.2	19.4	58	3.7	2.1	1.8	1.4	2.1	1.9	49.0	29.3	.3	.2	.9	69.5	17.4	80.3	179.7	80.5	44.2	5.3	[illegible]	67.6	15.1
Wyoming:																								
1941	8.3	18.7	50	2.5	(6)	.8	.8	(6)	3.2	11.1	34.9	1.6	(6)	3.2	66.7	11.1	73.8	199.2	48.4	39.7	2.4	69.0	90.5	[illegible]
1940	8.2	18.7	44	4.7	(6)	3.2	(6)	.8	1.6	15.2	7.2	3.2	.8	.8	81.6	15.2	73.6	188.8	39.2	44.8	.8	61.6	57.2	[illegible]
1930	8.8	18.2	54	4.9	.8	(6)	(6)	.8	1.6	25.1	19.5	.8	(6)	(6)	80.3	13.8	60.0	212.4	58.4	53.5	1.6	72.2	57.6	31.6

[1] Includes all States except Georgia, Kansas, Nevada, and West Virginia with data for the 6-month period of 1941, 1940, and 1939. The District of Columbia is included as a State. Estimated population July 1, 1941, 72,491,000.

[2] These data are taken from the July 1941 and July 1940 Statistical Bulletins published by the Metropolitan Life Insurance Co. All figures are provisional and are subject to correction, since they are based on provisional estimates of lives exposed to risk. Data do not include all diseases reported to the Public Health Service.

[3] Excludes pericarditis, acute endocarditis, and acute myocarditis.

[4] Classified as diarrhea and enteritis, age not specified.

[5] Chronic nephritis only.

[6] No deaths reported.

[7] January to May only.

[8] Less than 0.1 per 100,000 population.

[9] Data not available.

DEATHS DURING WEEK ENDED SEPTEMBER 27, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Sept. 27, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,380	7,489
Average for 3 prior years	7,666	
Total deaths, first 39 weeks of year	328,683	329,691
Deaths per 1,000 population, first 39 weeks of year, annual rate	11.8	11.8
Deaths under 1 year of age	513	521
Average for 3 prior years	504	
Deaths under 1 year of age, first 39 weeks of year	20,457	19,577
Data from industrial insurance companies:		
Policies in force	64,486,432	64,826,398
Number of death claims	10,571	10,752
Death claims per 1,000 policies in force, annual rate	8.5	8.7
Death claims per 1,000 policies, first 39 weeks of year, annual rate	9.6	9.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 4, 1941

Summary

The incidence of poliomyelitis declined—a total of 456 cases was reported as compared with 592 for the preceding week. The New England and the West South Central States reported the same number of cases as for the preceding week, the Pacific States reported 20 cases as compared with 19 last week, while the other geographic areas recorded decreases. Only 10 States reported 15 or more cases, as follows (last week's figures in parentheses): New York, 87 (115); Pennsylvania, 51 (66); Ohio, 32 (42); Tennessee, 27 (39); New Jersey, 22 (29); Alabama, 22 (35); Michigan, 19 (26); Illinois, 18 (31); Maryland, 18 (15); and Minnesota, 15 (16). The figures for the current week are the lowest since the week ended August 9. The largest number of cases for any one week was reported for the week ended August 30 (624 cases).

Of the nine common communicable diseases included in the following table, the incidence of only influenza, poliomyelitis, and whooping cough was above the 5-year (1936–40) median (3-year median for whooping cough, 1938–40).

Of 974 cases of influenza, 357 cases occurred in Texas, 183 cases in Virginia, and 110 cases in South Carolina. The principal excess incidence of whooping cough is apparently in the East North Central States.

While the current incidence of diphtheria and the cumulative total to date are below the median expectancy, the disease is unusually prevalent in the South Atlantic States, which reported 254 (or 42 percent) of the 599 cases reported for the current week.

Only three cases of infectious encephalitis were reported in Minnesota and four in North Dakota.

Of 105 cases of endemic typhus fever, 44 cases occurred in Georgia, 17 in Texas, and 12 in Florida. Two cases were reported in New York. Of 9 cases of Rocky Mountain spotted fever, 6 occurred in Oklahoma, and 1 case each in Illinois, Arkansas, and Oregon.

The crude death rate for the current week for 88 large cities in the United States is 10.7 per 1,000 population, as compared with 10.3 for the preceding week and a 3-year (1938–40) average of 10.6 for the corresponding week.

Telegraphic morbidity reports from State health officers for the week ended October 4, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940	
NEW ENG.												
Maine	0	2	1	-------	1	-------	28	28	7	0	0	0
New Hampshire	0	0	0	-------	-------	-------	7	0	1	0	0	0
Vermont	0	0	0	-------	-------	-------	0	0	3	0	2	0
Massachusetts	4	2	5	-------	-------	-------	53	97	37	3	0	0
Rhode Island	0	2	0	-------	-------	-------	2	1	1	0	1	1
Connecticut	0	0	2	1	1	1	4	5	4	1	0	1
MID. ATL.												
New York [2]	8	15	11	-------	[1] 8	[1] 8	48	93	45	3	1	4
New Jersey	2	11	7	3	2	7	24	29	11	0	0	0
Pennsylvania [2]	8	7	18	-------	-------	-------	90	148	34	2	1	1
E. NO. CEN.												
Ohio	30	21	34	4	16	1	18	16	16	0	2	2
Indiana	20	8	17	23	7	7	5	1	2	0	1	0
Illinois [3]	17	10	18	6	2	9	19	25	18	0	2	2
Michigan [4]	7	12	12	2	5	1	30	60	24	1	0	3
Wisconsin	0	2	2	25	14	17	39	124	27	0	2	1
W. NO. CEN.												
Minnesota	1	2	2	-------	2	1	23	3	3	0	0	0
Iowa	4	3	6	5	1	1	6	13	5	0	0	0
Missouri	2	6	7	1	-------	10	12	1	1	0	0	0
North Dakota	3	2	2	3	20	-------	6	2	1	0	0	0
South Dakota	7	4	1	-------	-------	-------	2	4	3	0	0	0
Nebraska	1	0	0	-------	-------	-------	8	10	2	0	1	0
Kansas	2	8	6	8	1	3	4	3	3	1	1	1
SO. ATL.												
Delaware	1	0	0	-------	-------	-------	0	1	1	0	0	0
Maryland [4]	2	7	7	-------	1	3	14	5	4	1	0	1
Dist. of Col.	5	0	4	1	-------	-------	3	0	0	0	0	0
Virginia	36	16	64	183	30	28	24	19	8	0	2	0
West Virginia	5	10	19	7	7	7	53	1	1	0	2	2
North Carolina	120	44	107	-------	2	2	35	13	15	1	0	1
South Carolina [2]	26	20	18	110	139	106	18	6	1	0	0	0
Georgia [2]	44	30	40	22	15	15	5	2	0	0	0	0
Florida [2]	15	6	7	3	1	1	4	0	0	0	0	0
E. SO. CEN.												
Kentucky	14	15	31	-------	-------	4	9	16	16	0	1	1
Tennessee [2]	10	12	35	5	14	12	38	81	6	0	0	1
Alabama [2]	34	14	35	-------	10	12	4	5	5	1	1	0
Mississippi [2] [4]	24	15	23	-------	-------	-------	-------	-------	-------	0	1	0
W. SO. CEN.												
Arkansas [3]	32	17	18	20	14	14	32	0	1	0	0	0
Louisiana [3]	9	9	13	39	-------	4	0	1	3	1	0	0
Oklahoma [3]	17	14	14	28	15	26	2	3	3	0	0	0
Texas [2] [5]	53	44	44	357	143	115	10	15	15	0	2	1
MOUNTAIN												
Montana	16	2	1	2	27	2	8	33	12	0	1	0
Idaho	0	0	0	5	-------	1	2	3	3	0	0	0
Wyoming	2	0	0	-------	2	-------	2	0	2	0	0	0
Colorado	2	5	6	23	7	-------	16	19	10	0	0	1
New Mexico	0	8	3	-------	-------	-------	4	11	9	0	0	0
Arizona	3	1	1	39	61	31	17	17	2	0	0	0
Utah [4]	0	0	0	4	2	1	5	1	3	0	0	0
Nevada	0	6	-------	-------	-------	-------	0	0	-------	0	0	-------
PACIFIC												
Washington	1	4	1	-------	-------	-------	5	4	6	0	0	0
Oregon [3]	1	4	4	6	9	9	14	7	7	0	0	0
California [2]	11	12	17	39	20	20	77	35	35	1	1	0
Total	599	432	664	974	599	579	824	961	922	16	23	29
40 weeks [5]	10,188	10,782	17,719	572,314	172,612	154,626	836,243	233,429	272,491	1,618	1,342	2,363

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 4, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940		Oct. 4, 1941	Oct. 5, 1940	
NEW ENG.												
Maine	7	0	0	4	2	11	0	0	0	3	0	1
New Hampshire	2	0	0	3	1	1	0	0	0	0	0	0
Vermont	1	0	0	0	4	5	0	0	0	0	0	0
Massachusetts	10	2	2	81	35	57	0	0	0	6	1	2
Rhode Island	1	0	0	0	1	3	0	0	0	0	0	0
Connecticut	12	1	1	10	7	13	0	0	0	1	5	3
MID. ATL.												
New York [2]	87	6	6	92	101	104	0	0	0	11	10	19
New Jersey	22	1	1	38	30	30	0	0	0	3	2	7
Pennsylvania [2]	51	11	11	65	85	127	0	0	0	18	15	26
E. NO. CEN.												
Ohio	32	44	12	118	121	126	0	0	0	18	12	17
Indiana	1	23	4	36	44	57	0	1	1	4	2	2
Illinois [3]	18	27	27	75	144	144	0	2	2	7	11	17
Michigan [4]	19	84	26	71	100	114	0	0	0	11	4	6
Wisconsin	2	30	10	66	51	69	0	1	1	1	1	2
W. NO. CEN.												
Minnesota	15	23	17	23	28	32	0	2	1	0	0	0
Iowa	2	70	14	34	28	38	0	0	0	3	1	5
Missouri	0	24	1	22	24	41	1	0	0	6	21	16
North Dakota	1	3	0	5	11	12	0	3	2	1	1	2
South Dakota	1	10	2	8	9	12	0	1	0	1	3	1
Nebraska	0	20	2	10	15	9	0	3	0	2	2	1
Kansas	0	27	10	41	34	76	0	0	0	2	6	3
SO. ATL.												
Delaware	0	0	0	4	2	4	0	0	0	0	0	0
Maryland [4]	18	2	2	18	18	24	0	0	0	5	4	10
Dist. of Col.	12	0	1	17	4	8	0	0	0	2	1	1
Virginia	10	20	2	15	24	32	0	0	0	7	6	14
West Virginia	1	48	4	21	29	46	0	0	0	8	2	7
North Carolina	7	3	3	77	61	68	0	0	0	4	14	14
South Carolina [2]	8	0	0	15	22	5	0	0	0	7	11	9
Georgia [2]	11	2	2	39	29	24	0	0	0	7	14	14
Florida [2]	7	1	1	4	7	4	0	0	0	8	0	1
E. SO. CEN.												
Kentucky	6	10	3	32	50	43	0	1	0	11	11	18
Tennessee [2]	27	2	2	54	70	45	0	0	0	18	16	16
Alabama [2]	22	0	1	36	15	19	0	0	0	6	7	9
Mississippi [2,4]	7	1	1	13	14	14	1	0	0	7	3	3
W. SO. CEN.												
Arkansas [3]	4	1	1	11	17	17	0	0	0	9	13	16
Louisiana [2]	1	4	1	11	2	3	0	0	0	6	10	12
Oklahoma [3]	3	3	3	16	14	14	0	1	1	6	5	15
Texas [2,5]	4	7	7	13	16	32	1	0	0	17	16	30
MOUNTAIN												
Montana	1	2	1	8	13	13	0	0	7	0	0	3
Idaho	0	3	0	1	9	9	0	0	1	0	1	1
Wyoming	0	0	0	3	4	4	0	0	0	0	0	0
Colorado	1	1	8	15	11	16	1	0	2	12	3	4
New Mexico	1	1	1	8	4	6	0	0	0	1	7	9
Arizona	0	0	0	3	4	4	0	0	0	2	0	1
Utah [4]	1	2	2	6	1	10	0	0	0	0	2	2
Nevada	0	0	------	0	0	------	0	0	------	0	2	------
PACIFIC												
Washington	7	20	4	41	18	22	0	1	1	0	2	3
Oregon [3]	8	2	2	10	8	19	0	0	0	0	0	1
California [2]	5	8	17	74	95	93	0	0	3	9	5	9
Total	456	555	391	1,367	1,436	1,664	4	16	33	250	252	347
40 weeks [5]	6,850	6,918	5,200	98,024	125,612	146,338	1,216	2,036	8,374	6,731	7,693	10,924

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 4, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended Oct. 4, 1941	Whooping cough, Week ended Oct. 5, 1940	Division and State	Whooping cough, Week ended Oct. 4, 1941	Whooping cough, Week ended Oct. 5, 1940
NEW ENG.			SO. ATL.—continued		
Maine	10	17	North Carolina	79	139
New Hampshire	14	2	South Carolina [2]	31	23
Vermont	2	1	Georgia [2]	55	5
Massachusetts	138	117	Florida [2]	16	3
Rhode Island	43	7	E. SO. CEN.		
Connecticut	47	64	Kentucky	72	108
MID. ATL.			Tennessee [2]	26	27
New York [2]	359	201	Alabama [2]	15	18
New Jersey	133	95	Mississippi [2] [4]		
Pennsylvania [2]	204	358	W. SO. CEN.		
E. NO. CEN.			Arkansas [3]	27	7
Ohio	225	256	Louisiana [2]	2	3
Indiana	10	15	Oklahoma [3]	11	12
Illinois [3]	182	109	Texas [2] [5]	68	85
Michigan [4]	347	318	MOUNTAIN		
Wisconsin	206	96	Montana	8	1
W. NO. CEN.			Idaho	0	1
Minnesota	47	23	Wyoming	7	0
Iowa	5	23	Colorado	68	8
Missouri	9	18	New Mexico	18	23
North Dakota	27	12	Arizona	4	9
South Dakota	1	4	Utah [4]	11	9
Nebraska	0	5	Nevada	4	0
Kansas	41	33	PACIFIC		
SO. ATL.			Washington	55	17
Delaware	3	26	Oregon [3]	11	10
Maryland [4]	57	74	California [2]	186	240
Dist. of Col	15	1	Total	2,937	2,669
Virginia	24	25			
West Virginia	14	21	40 weeks [5]	168,881	125,572

[1] New York City only.

[2] Typhus fever, week ended Oct. 4, 1941, 105 cases, as follows: New York, 2; Pennsylvania, 1; South Carolina, 6; Georgia, 44; Florida, 12; Tennessee, 3; Alabama, 4; Mississippi, 8; Louisiana, 6; Texas, 17; California, 2.

[3] Rocky Mountain spotted fever, week ended Oct. 4, 1941, 9 cases, as follows: Illinois, 1; Arkansas, 1; Oklahoma, 6; Oregon, 1.

[4] Period ended earlier than Saturday.

[5] Figures for Texas are for the current week instead of a week earlier as has been the case previously. Figures for the week ended Sept. 27, 1941, are as follows: Diphtheria, 32; influenza, 350; measles, 15; meningococcus meningitis, 2; poliomyelitis, 4; scarlet fever, 22; smallpox, 1; typhoid and paratyphoid fever, 13; whooping cough 99; typhus fever, 23.

WEEKLY REPORTS FROM CITIES

City reports for week ended Sept. 20, 1941

This table lists the reports from 135 cities of more than 10,000 population distributed throughout the United States, and represents a cross-section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	1	0	0	0	0	3	25
New Hampshire:											
Concord	0	------	0	0	1	0	0	1	0	0	9
Manchester	0	------	0	0	2	4	0	0	0	0	15
Nashua	0	------	0	0	0	0	0	2	0	3	15
Vermont:											
Barre	0	------	------	0	------	0	0	------		0	------
Burlington	0	------	------	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	0	4	6	13	0	4	0	38	157
Fall River	4	------	0	0	1	2	0	1	0	0	18
Springfield	0	------	0	1	0	4	0	1	0	4	26
Worcester	0	------	0	0	8	0	0	1	0	4	45
Rhode Island:											
Pawtucket	1	------	0	0	0	1	0	0	0	0	12
Providence	8	------	0	0	1	2		0	1	36	55
Connecticut:											
Bridgeport	0	------	0	1	1	0	0	1	1	2	29
Hartford	0	------	0	1	0	1	0	0	0	2	37
New Haven	0	------	0	0	2	0	0	1	0	5	42
New York:											
Buffalo	0	------	0	1	6	9	0	6	0	8	112
New York	7	2	0	12	37	33	0	51	11	193	1,224
Rochester	0	------	0	0	2	1	0	0	0	4	36
Syracuse	0	------	0	1	2	0	0	0	0	21	33
New Jersey:											
Camden	1	------	0	0	1	0	0	0	1	1	29
Newark	0	------	0	2	1	1	0	4	0	33	81
Trenton	0	------	0	0	1	0	0	1	0	2	29
Pennsylvania:											
Philadelphia	1	------	2	0	18	11	0	21	3	45	428
Pittsburgh	1	1	1	1	8	7	0	6	2	33	141
Reading	0	------	0	1	0	1	0	0	0	2	27
Scranton	0	------	------	1	------	0	0	------	0	2	------
Ohio:											
Cincinnati	0	2	0	1	0	7	0	1	0	7	111
Cleveland	0	2	0	0	1	11	0	12	0	69	170
Columbus	0	------	0	0	0	2	0	1	0	3	79
Toledo	0	------	0	0	2	2	0	3	0	20	70
Indiana:											
Anderson	0	------	0	0	1	0	0	0	0	2	7
Fort Wayne	1	------	0	0	0	1	0	0	0	0	25
Indianapolis	0	------	0	2	10	6	0	2	0	3	98
Muncie	0	------	0	0	0	1	0	0	0	5	11
South Bend	0	------	------	0	------	0	0	------	0	0	------
Terre Haute	0	------	0	0	0	0	0	0	0	0	9
Illinois:											
Alton	0	------	0	0	0	0	0	0	0	0	15
Chicago	4	------	0	8	20	34	0	36	1	100	582
Elgin	0	------	0	0	2	1	0	0	0	5	12
Moline	0	------	0	0	0	0	0	0	0	1	8
Springfield	0	------	0	1	0	1	0	0	0	3	13
Michigan:											
Detroit	6	1	0	4	2	19	0	15	0	87	223
Flint	0	------	0	0	2	2	0	0	0	1	26
Grand Rapids	0	------	0	0	0	1	0	0	0	4	28
Wisconsin:											
Kenosha	0	------	0	0	0	0	0	0	0	3	8
Madison	0	------	0	1	2	1	0	0	0	2	10
Milwaukee	0	------	0	2	3	12	0	2	0	0	104
Racine	0	------	0	1	0	8	0	0	0	6	7
Superior	0	------	0	0	1	2	0	0	0	15	9
Minnesota:											
Duluth	0	------	0	0	2	1	0	1	0	13	21
Minneapolis	0	------	0	1	2	5	0	0	0	11	107
St. Paul	0	------	0	1	4	5	0	1	0	22	70

City reports for week ended Sept. 20, 1941—Continued

State and city	Diphtheria cases	Influenza: Cases	Influenza: Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0			0		0	0		1	0	
Davenport	0			0		0	0		0	0	
Des Moines	0		0	0	0	2	0	0	0	1	30
Sioux City	0			1		0	0		0	8	
Waterloo	0			0		1	0		1	2	
Missouri:											
Kansas City	0		0	1	2	3	0	8	0	0	79
St. Joseph	0		0	1	0	0	0	1	0	0	20
St. Louis	0		0	1	7	7	0	6	1	9	109
North Dakota:											
Fargo	0		0	0	2	0	0	0	0	0	9
Grand Forks	0			0		0	0		1	0	
Minot	1		0	3	0	0	0	0	0	0	9
South Dakota:											
Aberdeen	0			0		0	0		0	2	
Sioux Falls	0		0	0	0	0	0	0	0	0	8
Nebraska:											
Lincoln	0			0		0	0		0	2	
Omaha	6		0	1	3	0	0	2	0	2	35
Kansas:											
Lawrence	0		0	0	0	0	0	0	0	1	2
Topeka	0		0	0	1	4	0	0	0	5	18
Wichita	0		0	0	2	0	0	1	1	8	23
Delaware:											
Wilmington	0		0	2	3	5	0	0	0	0	24
Maryland:											
Baltimore	1	1	0	11	5	3	0	10	5	51	183
Cumberland	0		0	0	1	3	0	0	0	0	11
Frederick	0		0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	1		0	6	7	5	0	14	0	13	151
Virginia:											
Lynchburg	0		0	0	1	0	0	1	1	0	10
Norfolk	0		0	0	2	1	0	2	0	0	22
Richmond	1		0	0	0	1	0	2	0	0	42
Roanoke	0		0	0	0	1	0	1	0	0	19
West Virginia:											
Charleston	0		0	0	0	0	0	0	0	0	21
Huntington	0			0		1	0		1	0	
Wheeling	0		0	0	0	1	0	0	0	5	13
North Carolina:											
Gastonia	0			0		0	0		0	0	
Wilmington	0		0	1	0	0	0	1	0	8	7
Winston-Salem	0		0	4	1	1	0	0	0	5	12
South Carolina:											
Charleston	0		0	0	0	0	0	0	1	1	18
Florence	0		0	0	1	0	0	0	0	1	8
Greenville	0		0	0	0	0	0	0	0	1	12
Georgia:											
Atlanta	0		0	0	3	3	0	2	0	1	64
Brunswick	0		0	0	0	0	0	0	0	1	3
Savannah	0		0	0	1	0	0	2	1	4	34
Florida:											
Miami	0		0	0	0	0	0	2	0	4	21
St. Petersburg	0		0	0	0	0	0	1	0	0	20
Tampa	1		0	1	0	0	0	0	0	0	18
Kentucky:											
Ashland	1		0	0	0	0	0	1	0	2	7
Covington	0		0	0	1	2	0	1	0	0	13
Lexington	0		0	0	0	0	0	2	0	2	8
Louisville	0		0	1	4	3	0	2	1	29	56
Tennessee:											
Knoxville	0		0	0	1	0	0	2	0		21
Memphis	0		0	1	1	3	0	2	0	4	41
Nashville	0		0	3	2	4	0	5	0	10	46
Alabama:											
Birmingham	1	2	0	0	3	3	0	3	0	1	78
Mobile	0		0	0	1	0	0	0	0	0	24
Montgomery	0			0		0	0		0	1	
Arkansas:											
Fort Smith	0			0		0	0		0	2	
Little Rock	0	1	0	0	2	0	0	1	0	1	27

City reports for week ended Sept. 20, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	0	5
New Orleans	0	------	0	0	9	2	0	0	2	0	130
Shreveport	0	------	0	0	2	0	0	0	1	0	29
Oklahoma:											
Oklahoma City	0	2	0	0	4	0	0	0	2	0	46
Tulsa	1	------	0	0	1	0	0	1	0	0	15
Texas:											
Dallas	3	------	0	6	1	3	0	2	0	11	62
Fort Worth	2	------	0	0	2	0	0	1	0	5	23
Galveston	0	------	0	0	1	0	0	0	0	0	12
Houston	3	1	0	1	2	2	0	2	1	6	77
San Antonio	1	7	1	0	8	0	0	8	0	3	50
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	8
Great Falls	0	------	0	0	3	0	0	0	0	0	12
Helena	0	------	0	0	0	0	0	0	0	0	7
Missoula	0	------	0	0	0	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	0	0	0	0	0	0	6
Colorado:											
Denver	5	12	0	5	2	2	0	4	0	47	85
Pueblo	0	------	0	0	2	0	0	0	0	3	7
New Mexico:											
Albuquerque	0	------	0	0	1	0	0	1	1	1	14
Arizona:											
Phoenix	0	10	------	0	------	0	0	------	0	7	------
Utah:											
Salt Lake City	0	------	0	0	0	1	0	2	0	9	33
Washington:											
Seattle	0	------	0	0	2	1	0	3	0	14	97
Spokane	0	------	0	0	4	3	0	0	0	5	30
Tacoma	0	------	0	0	1	0	0	0	0	3	40
Oregon:											
Portland	0	1	1	5	2	2	0	0	0	3	74
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	4	5	0	7	3	13	0	16	5	27	302
Sacramento	0	------	0	2	0	3	0	0	0	0	19
San Francisco	0	1	1	3	2	6	0	8	1	16	165

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
New Hampshire:			
Manchester	0	0	1
Massachusetts:			
Boston	0	0	6
Fall River	0	0	1
Springfield	1	0	0
Worcester	0	0	5
Connecticut:			
Bridgeport	0	0	2
Hartford	0	0	1
New York:			
Buffalo	0	0	4
New York	1	0	52
Rochester	0	0	5
Syracuse	0	0	3
Pennsylvania:			
Philadelphia	0	0	11
Pittsburgh	0	0	9
Ohio:			
Cincinnati	0	0	4
Cleveland	0	0	18
Toledo	0	0	1
Indiana:			
Fort Wayne	0	0	1
Indianapolis	0	0	2

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Illinois:			
Chicago	1	0	13
Springfield	0	0	1
Michigan:			
Detroit	0	0	20
Grand Rapids	0	0	2
Wisconsin:			
Madison	0	0	1
Minnesota:			
Minneapolis	0	0	9
St. Paul	0	0	6
Iowa:			
Des Moines	0	0	2
Missouri:			
Kansas City	0	0	1
St. Louis	0	0	3
Kansas:			
Wichita	0	0	1
Delaware:			
Wilmington	0	0	1
Maryland:			
Baltimore	2	0	5
Frederick	0	0	2
District of Columbia:			
Washington	0	0	3

City reports for week ended Sept. 20, 1941—Continued

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Polio-myelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Polio-myelitis cases
Virginia:				Louisiana:			
Richmond	0	0	1	Shreveport	0	0	2
South Carolina:				Texas:			
Charleston	0	0	1	Fort Worth	0	0	2
Florida:				Colorado:			
Miami	0	0	1	Pueblo	0	0	1
Tennessee:				Utah:			
Knoxville	0	0	1	Salt Lake City	0	0	2
Nashville	0	0	5	Washington:			
Alabama:				Seattle	0	0	2
Birmingham	0	0	3	Oregon:			
Montgomery	0	0	1	Portland	0	0	5
Arkansas:				California:			
Fort Smith	0	0	1	Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Nashua, 1; Springfield, Mass., 1; Philadelphia, 1; Duluth, 1; Minneapolis, 10; Denver, 2; Phoenix, 1. Deaths: New York, 2.

Pellagra.—Cases: Fall River, 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 2; Memphis, 1; Phoenix, 1.

Rabies, in man.—Deaths: Cleveland, 1.

Typhus fever.—Cases: Baltimore, 1; Charleston, S. C., 1; Savannah, 1; Miami, 2; Tampa, 1; Birmingham, 2; New Orleans, 2; Shreveport, 1; Dallas, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,790,805)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
Week ended Sept. 20, 1941	8.5	5.8	0.8	15.9	36.0	43.1	0.0	42.6	6.2	162.5
Average for week, 1936-40	14.0	6.7	2.0	24.9	45.0	53.0	.3	40.9	9.6	161.6

PLAGUE INFECTION IN FLEAS FROM PRAIRIE DOGS IN VALENCIA COUNTY, N. MEX.

Under date of Sept. 20, 1941, plague infection was reported found upon examination of specimens at the laboratory in San Francisco, Calif., in a pool of 147 fleas collected from 59 prairie dogs, *Cynomys gunnisoni zuniensis*, shot Sept. 5 at locations 10 miles east and 2 miles southwest of Ramah, Valencia County, N. Mex., and in another pool of 188 fleas from 29 prairie dogs of the same species shot 8 miles east of Ramah on Sept. 9.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on August 29, 1941, and another found on September 4, 1941, both in Paauhau, Hamakua District, Island of Hawaii, T. H., have been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended August 30, 1941.—During the week ended August 30, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1		1	7	1		1	3	14
Chickenpox				3	15		3	4	8	33
Diphtheria		3	1	11	2		3	1		21
Dysentery				10						10
Influenza		6				2				8
Lethargic encephalitis					1	95	[1] 125	10		231
Measles			1	69	38	2	3	1	27	141
Mumps				36	23	10	7	4	6	86
Pneumonia		3				3	2		3	11
Poliomyelitis		1	29		15	83	7	40	5	180
Scarlet fever		6	2	42	41	2	7	15	13	128
Smallpox							1			1
Tuberculosis	5	1	8	65	18		2			99
Typhoid and paratyphoid fever			4	15	2		6	8	3	38
Whooping cough		1		140	85		3	5	12	246

[1] Encephalomyelitis.

CUBA

Habana—Communicable diseases—4 weeks ended September 20, 1941.—During the 4 weeks ended September 20, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	8		Scarlet fever	1	
Leprosy	2		Tuberculosis	4	2
Malaria	1		Typhoid fever	30	1
Measles	4				

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Amazonas State—Codajaz, July 21, 1941, 1 death; Para State—Irituia, July 11, 1 death; S. Sebastiao Boa Vista, August 6, 1 death.

Colombia.—Yellow fever has been reported in Colombia as follows: Intendencia of Meta—San Martin, Acacias, August 5, 1941, 1 death; Santander Department—Guamales, August 13, 1 death; Guayacan, July 7, 1 death; La Colorada, July 29, 1 death; La Granada, August 5, 1 death; Las Flores, August 11, 1 death, August 13, 1 death.

Venezuela—Bolivar State—Guasipati—Correction.—The reports of the presence of yellow fever in Guasipati, Bolivar State, Venezuela, in July (PUBLIC HEALTH REPORTS of Sept. 5, 1941, p. 1818, and Sept. 26, p. 1939) were erroneous. The case referred to in those reports occurred during the week ended August 16, 1941.

COURT DECISION ON PUBLIC HEALTH

City held not liable for death of child by drowning in cesspool.—(Texas Supreme Court; *Gotcher et ux.* v. *City of Farmersville*, 151 S.W.2d 565; decided May 7, 1941, motion for rehearing overruled June 4, 1941.) An action to recover damages was brought against the city of Farmersville by the parents of a 7-year-old child who was drowned in a sanitary cesspool maintained by the city for the use and benefit of its inhabitants.

The essential allegations made by the plaintiffs were: The cesspool was an open structure approximately 20 feet wide, 40 feet long, 9 or 10 feet deep, and divided into 4 or 5 compartments. The outside walls extended above the ground 6 or 8 inches and no fence or other safeguard or protection was maintained. The compartments were filled with some acid used in the decomposition of sewage and the process of decomposition caused a collection of sediment on the top of the acid and liquid which, after a time, dried, cracked, and presented the appearance of a solid mass. The plaintiff mother, with 3 of her children and others, went on the premises in the vicinity of the cesspool to gather persimmons and as they approached the pool—which the mother did not know was located in the vicinity—one of her children turned from the path being traveled, made a dash for the cesspool, jumped into it, and was drowned. The defendant knew, or should have known, that children customarily played in the vicinity of the cesspool and thus there was extended an implied invitation for the mother to enter upon the premises and the deceased to play in the vicinity of the pool. Because of the cesspool's location and construction and the sediment having the general appearance of a

baby pool or sand pile usually employed for the amusement of young children, there was created a public and attractive nuisance which was especially attractive to the plaintiffs' child.

From judgments in both the trial court and the court of civil appeals in favor of the city, the case was taken to the Supreme Court of Texas. The latter court said that the court of civil appeals was correct in holding that the city was engaged in a governmental function in the maintenance of its sanitary sewer system, including the cesspool, and that by reason thereof was not liable for any negligence of its employees in the operation of the system.

With reference to the plaintiffs' contention that the cesspool constituted a nuisance and that the city was liable for damages caused by the maintenance thereof, even though engaged in the exercise of a governmental function, the supreme court held that, in order to create liability, the nuisance had to constitute in some way an unlawful invasion of the rights of others and that such facts as were necessary to create liability were not alleged in the instant case.

Regarding the contention that the cesspool was so situated and maintained as to constitute an attractive nuisance and thereby endanger the lives of children, the court said that liability under the attractive nuisance doctrine was based on the theory that the dangerous thing was so situated and maintained as to attract children from the street or from some public place where they may be expected to be, thus raising a presumption that the parties so maintaining the nuisance should have foreseen and anticipated the injury. The allegations, said the court, showed that the deceased child was not attracted to the vicinity of the cesspool but was taken by his mother upon the premises near where it was maintained. "It appears, therefore, that the child was not upon the premises because of any attraction or allurement of the cesspool; and consequently the attractive nuisance doctrine passes out of the case."

The judgments of the lower courts were affirmed.

×

Public Health Reports

VOLUME 56 OCTOBER 17, 1941 NUMBER 42

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56 • OCTOBER 17, 1941 • No. 42

THE PUBLIC HEALTH ADMINISTRATOR'S RESPONSIBILITY IN THE FIELD OF OCCUPATIONAL DISEASE LEGISLATION[1]

By J. J. BLOOMFIELD, *Sanitary Engineer*, and W. M. GAFAFER, *Senior Statistician, United States Public Health Service*

One of the important factors contributing to the progress made in health and safety in American industries has been the passage of constructive workmen's compensation legislation. Although such legislation has been in effect in other countries for many years, the United States was the last important industrial country to adopt the compensation principle. All but one State now provide compensation to workers for accidental injuries; however, there are only 25 States which make provision for compensating workers suffering from occupational diseases. Even in these 25 States, the laws are far from uniform and the diseases compensated vary from one in one State to any and all diseases which may be traceable to the occupation in other States.

The present paper does not concern itself particularly with the subject of compensation for occupational diseases, nor does it treat with the many controversial aspects of the problem. It does deal, however, with the role which the public health administrator can play in the development of such legislation and discusses certain responsibilities which such laws necessarily impose upon him.

PRESENT METHODS OF DEVELOPING FACTS FOR LEGISLATION

A review of our State occupational disease compensation laws will readily disclose that in certain instances a State with little or no knowledge of its own needs has merely copied what has been found to be expedient to enact in some other State. This has been especially true in the enactment of the so-called schedule type of law where the specific diseases for which compensation will be provided are listed. Of late, however, there has been a definite trend toward obtaining factual data on needs. This has been accomplished by the appointment, either by the governor of the State or the legislature, of an occupational disease commission, which is charged with the express duties of determining the nature and extent of the occupational disease problem of the State, and any other facts which may

[1] From the Division of Industrial Hygiene, National Institute of Health.

be used as a guide in the development of a fair and just compensation law.

In most States these occupational disease commissions have realized that, along with certain legal and administrative questions, there are also health problems involved. For information on health the State health departments have usually been consulted. Because industrial hygiene has been, until recently, a new departure in many States, the State departments of health have looked to the Division of Industrial Hygiene, National Institute of Health, of the United States Public Health Service, for guidance in such matters. The Public Health Service has welcomed such requests for collaboration, since it realized that here was a rare opportunity to perform a dual service: First, the necessary information may be obtained for the guidance of the occupational disease commission; and second, the State department of health has the opportunity to define the State's industrial hygiene problem, and thus the opportunity to lay the foundation for a future program of prevention of industrial health hazards. This cooperative effort is illustrated by what has recently taken place in the State of Utah.

In 1936, the Industrial Commission of Utah requested the Federal Government to make a study of the nature and prevalence of occupational diseases in Utah industries. Following a number of conferences the Division of Industrial Hygiene, National Institute of Health, of the United States Public Health Service, agreed to undertake such a study with the cooperation of Utah State agencies, such as, among others, the Industrial Commission, the State Board of Health, industrial organizations, and labor groups.

In order that the objectives of the proposed study and the responsibilities of each agency affected would be understood, the Public Health Service prepared a memorandum in the form of an agreement, which could be used for the guidance of all organizations that were to take part in the proposed survey. As set forth in this memorandum the purpose of the study was to evaluate the various factors bearing on the health of Utah workers, in order that this information could be used as a guide in the drafting and enactment of legislation for the compensation of injury to health resulting from exposure to industrial health hazards. It was also pointed out that basic data such as would be revealed by these studies would be useful in the support and application of a program designed to control industrial health hazards.

In the memorandum submitted on October 6, 1936, the plan called for two studies: The first, of a preliminary and qualitative nature, was expected to be more in the form of a general inventory of working conditions to reveal the potential industrial health hazards existing in the State. It was thought that from this preliminary survey it would be possible to determine which particular health hazards were

in need of further study. The second survey was to be more detailed and specific, quantitative in nature, and to include medical examinations of workers, engineering studies of the working environment to determine the relationship between the environment and the health of workers, and investigation of any other factors throwing light on the industrial health problem. The responsibilities of all cooperating agencies were clearly defined in this memorandum, which was signed on February 24, 1937, by representatives of industry and labor.

The preliminary survey was conducted during the latter part of 1937 and the early part of 1938 by personnel from the Utah State Board of Health under the guidance of Public Health Service officers. The data were analyzed and the report was prepared and published by the Public Health Service. The report, issued in October 1938, showed the number of workers in the various industries in the State who were exposed to certain materials and conditions which might be considered potentially hazardous to health. As a result of this study it was possible to determine the major potential hazards in Utah industries, in which industries they occurred, and those which merited further study. The report also disclosed present facilities for coping with industrial health hazards in the State and specific data on the extent of control measures then in vogue.

In connection with these findings, however, attention was called to the limitations of the data which were collected. Since no quantitative measurements of the working environment were made, and no medical examinations were conducted at this time, the information obtained disclosed only the potentialities involved, and in no way could exposure be implied to indicate actual injury. Likewise, the listing of control measures merely indicated that such control measures were available, and did not show whether or not they were effective. Hence, although it was known from this first study that conditions existed favoring the occurrence of certain occupational diseases, it was still necessary to determine to what extent these diseases occurred and the public health and economic implications involved. These answers could be obtained by carrying out the second series of studies as outlined in the original agreement of 1937. For this reason, the State legislature was requested to appropriate certain funds to help defray the expense of such a study. It was assured that the Public Health Service, in compliance with the original agreement, would assign personnel to work in cooperation with the State Board of Health and other agencies for the purpose of conducting detailed studies of industrial health hazards revealed in the first survey.

In March 1939, legislation was passed authorizing and directing the State Board of Health, in collaboration with the Public Health Service

and the State Industrial Commission, to carry out such a study. This legislation included an appropriation of $25,000.

After analysis of the data obtained in the first survey, the Public Health Service considered that the major problems for detailed investigation in Utah were exposure to siliceous dusts, lead and other metallic dusts, fumes, and gases. The chief industries in which these hazards might exist were coal mines, nonferrous metal mines, and nonferrous smelters.

The time allowed by the legislature in which to complete this study necessarily limited the number of industries which could be investigated, and, hence, the study was confined to these three industries. There are potential health hazards in other industries of the State which are constantly being studied by the industrial hygiene personnel of the State Board of Health. Information already exists concerning the health hazards in some of these industries which should permit the planning of a preventive program for their control.

The United States Census for 1930 showed that there were approximately 170,000 persons gainfully employed in the State of Utah, out of a total population of over 500,000. The industries included in this study employed approximately 16,000 workers. Representative plants employing some 3,000 workers were selected for detailed study; the selection was made by the Public Health Service and was based on all available data obtained in the preliminary survey. Three coal mines, three metal mining enterprises, and two smelters were selected for intensive medical and environmental study.

The plant operators furnished certain services and facilities to assist the field staff in its study of working conditions in the plants and of the health of the employees. The local labor unions assumed the responsibility of supplying members for physical examination and assisted in various other ways with the study. Every available employee of each plant, including the clerical staff and officers, was examined. It was decided that all records obtained in the study were to become the property of the Public Health Service, and that all information obtained would be strictly confidential. In this connection, instead of recording the man's name, he was given a serial number. Physical examination findings of the individual were not revealed to the employer and the environmental findings of the plant were not revealed to the employees.

The field work was begun early in July 1939, and continued until the latter part of December. During this period occupational and medical histories, and physical and roentgenologic examinations were made on 2,839 men in the three industries. The medical examination included a complete oral examination by a dentist as well as the following laboratory examinations: serologic tests for syphilis, punctate basophilia and reticulocyte estimations for lead absorption, hemo-

globin determinations, and routine urinalyses. Also, 961 urine specimens, collected from workers who were exposed to various compounds of lead, were examined spectroscopically for lead content.

Engineering studies were made in each plant to evaluate the working environment in the various occupations by making determinations of the environmental factors which may have a bearing on health. In this connection, examinations were made as to the nature and concentration of various types of dust such as silica, lead, arsenic, and cadmium. Studies of ventilation and humidity were carried out, and exposure to various gases, such as sulfur dioxide, carbon dioxide, carbon monoxide, hydrogen sulfide, hydrogen cyanide, and methane, was determined. Moreover, methods and facilities for the control of health hazards, already in use by the industries, were investigated, with the view of recommending additional control measures which might be necessary to eliminate such hazards.

A general sanitary survey of these plants and the communities in which the workers lived was carried out by the Division of Sanitary Engineering of the Utah State Board of Health. Such items as water supply, sewage disposal, milk sanitation, housing, and other data pertinent to the problem were studied.

In the original memorandum of 1937, the Public Health Service stressed the importance of a continuing program designed to control industrial health hazards. For this reason the Public Health Service agreed to assume full responsibility in carrying out the provisions of the law relative to this study, and in consideration of this, recommended to the Utah State Board of Health that it employ the $25,000 appropriated by the legislature for the conduct of the study toward the development of a permanent industrial hygiene service in the State. This recommendation was adopted and such a service is now available in the State Health Department, the personnel consisting of a physician-director, an engineer, a laboratory technician, and a clerk, and provided with facilities and equipment necessary to carry out a program of industrial health conservation. The above personnel augmented the staff of the Public Health Service in carrying out all phases of the study, and thereby have gained practical training and experience in the practice of industrial hygiene.

In addition to the above services contributed by the Utah State Board of Health, all of the full-time district health officers of Utah took an active part in the medical field studies; serologic tests were conducted by the State public health laboratory; the dental division cooperated by furnishing the services of a dentist for the oral hygiene studies; the Division of Epidemiology furnished valuable statistical information concerning the extent of certain diseases in the communities in which the workers lived; and, finally, the Division of Sanitary Engineering carried out a sanitary survey as mentioned above.

Thus, it is evident that through the medium of these industrial hygiene studies, an earnest effort has been made in Utah to lay a basis for the modern approach to the industrial hygiene problem, integrating industrial hygiene services with the various other services of the State health department and cooperating with all other interested State agencies and organizations.

The Utah occupational disease compensation law, officially known as the "Utah Occupational Disease Disability Law", became effective July 1, 1941, two years after the State legislature authorized the making of the industrial hygiene studies. The law is administered by the Industrial Commission and provides for the compensation of specific diseases or conditions covered by a schedule containing 27 items. Reference has been made to the desirability, if not the necessity, of obtaining factual data on needs to facilitate the preparation of adequate occupational disease legislation. Furthermore, it is generally agreed at the present time that an occupational disease law should:

(1) Provide for an agency for the administration of the law.

(2) Unambiguously define the diseases or conditions to be compensated.

(3) Make clear the liability of an employer for disease existing on the effective date of the law.

(4) Provide for limitations relating to the filing and establishment of claims.

(5) Provide for the diagnosis of disease, and the evaluation of disability.

(6) Provide for the awarding of adequate compensation.

(7) Impose the cost of compensation upon the employer responsible for the disablement, and relieve from liability an employer not responsible for the disablement.

(8) Provide for alternate liabilities or remedies of employers and employees electing or rejecting compensation under provisions of the occupational disease law.

(9) Provide for the prevention and control of occupational diseases.

No item of those listed is probably of more importance than the last which has to do with prevention and control. Since generally the various State occupational disease laws were not prepared with the idea of preventing and controlling occupational diseases, it is desirable to consider the subject, particularly, certain responsibilities created by the inclusion in the law of provisions for the prevention and control of occupational diseases.

LEGISLATION FOR THE PREVENTION AND CONTROL OF OCCUPATIONAL DISEASES

One of the inherent weaknesses of nearly all occupational disease laws which have been enacted in the United States is the omission of any provision for the prevention and control of occupational diseases. In nearly every instance, the desire has been to provide compensation for occupational disease injuries, whereas the prevention and control

of such diseases should be one of the prime considerations. As a matter of fact, the prevention of occupational diseases should be definitely desirable to both employer and employee. This is an obvious fact of tremendous socio-economic implications.

At the present time only a few States have made specific provision for occupational disease prevention in the compensation laws themselves. Notable for such provisions are the laws enacted in the States of Maryland, North Carolina, and Arkansas. While in many States either the labor department or the industrial commission performs certain functions in this field in cooperation with health officials, several States (Montana, Idaho, Connecticut, Mississippi, Minnesota, and Rhode Island) have by special law placed exclusive industrial hygiene jurisdiction in the health department. The problem being primarily one of health, legislators have realized the necessity for charging State health departments with the supervision, regulation, and control of industrial health hazards. The public health administrators should realize that the enactment of such legislation carries certain responsibilities.

In many States the reporting of occupational diseases is mandatory, such reports as a rule being made to the State health department. Reporting of occupational diseases in this country has been very incomplete. There are many reasons for this, and it is not intended to dwell upon these now, except to indicate that a fair degree of success can be anticipated only when close contact is maintained between each reporting physician or management and the agency to which occupational disease reports are sent. This implies the necessity for an educational effort on the part of the public health administrator and a service in prompt follow-up of the cases reported. Physicians should be made to realize that they must adopt the same attitude toward the reporting of occupational diseases which now exists with regard to the reporting of communicable diseases. The recurrence of such diseases may be obviated by prompt investigation on the part of a State industrial hygiene service of those conditions in the plant which may be the causative agent. Once this has been established, prompt measures may be taken for the control of the environmental conditions responsible for the diseases.

Another responsibility to be assumed by public health administrators is that dealing with the formulation of reasonable rules and regulations designed to prevent and control occupational diseases. Even if the health agency is not charged by law to establish such rules, it should be in a position to render the necessary scientific consultation services to the State agency so charged. The Idaho law which established a bureau of industrial hygiene in the State health department specifically provides that such consultation services should be given by the industrial hygiene bureau to the industrial accident

commission. On the other hand, the Maryland compensation law specifically charges the State health department and Baltimore city health department with the duty of formulating, adopting, and administering rules and regulations designed to prevent and control occupational diseases.

It is unnecessary at this time to discuss one of the main functions of an industrial hygiene service, namely, the systematic and prompt investigation of industrial establishments for the purpose of evaluating and controlling hazards to health. Activities of this kind constitute the major function of divisions of industrial hygiene, and the correction of conditions inimical to health should be the main goal of public health administrators. However, there is one aspect of such investigations in need of clarification. There appears to be a belief among certain individuals and agencies that industrial hygiene divisions in health departments use their findings only for educational purposes, attempting to convince management by persuasion that it would be desirable to effect the necessary changes to correct hazardous plant conditions. This is true to a great extent, since experience has shown that often much more can be accomplished by persuasive tactics than by the use of force, yet one should not get the impression that health agencies do not resort to force when necessary. Every health department has sufficient power under its basic organic act to take drastic measures in the prevention and control of health hazards. Although the regulation of working conditions is usually a function of labor departments or industrial commissions by specific legislative enactment, health departments have more than sufficient authority in this connection and in certain recalcitrant cases have not hesitated to use this authority.

There is one other responsibility which should be assumed by public health administrators, namely, assistance to workmen's compensation agencies in the adjudication of claims. From time to time a compensation commission needs impartial facts which might throw light on a claim. The facts may vary from a health appraisal of the claimant to a study of the working environment where the alleged disease has been contracted. It is our firm belief that public health administrators should be prepared to render such services whenever called upon to do so, unless specific legislation prohibits the use in litigation of results of investigations. It is often claimed that the division of industrial hygiene will lose the confidence of the employer if it testifies to certain findings of a study made in the plant involved in litigation. This argument works both ways, since the facts may also tend to disprove the employee's claim for compensation. It has been our observation that an industrial commission can, in most instances, settle a claim on the evidence submitted and the number of times a commission calls upon a study of the workroom environment

or an examination of the worker is limited to a few cases a year. No intelligent employer or employee should have any fault to find with a clear and impartial statement of the facts, based upon scientific inquiry. The proponents for establishing industrial hygiene services within the very agency which adjudicates compensation claims for occupational diseases are on untenable ground, since such an agency is no longer unbiased, being in the unhappy role of judge and prosecutor. The employee, the employer, and the agency adjudicating a compensation claim should welcome the investigation and report of conditions by an impartial agency on an impartial basis.

SUMMARY

An attempt has been made to emphasize some of the responsibilities and opportunities confronting public health administrators in the development, enactment, and administration of occupational disease legislation. Some of these opportunities and responsibilities have been discussed and an example of certain procedures has been given by citing the study made in the State of Utah. The results of the Utah study materially helped to establish the extent and nature of the industrial health problem in that State, thereby furnishing basic information to the occupational disease commission on which to formulate a constructive compensation law for occupational disease injuries. In addition, the study yielded sufficient data on which to base a permanent program in industrial hygiene, one which is now in full progress. The foresight shown in the organization and development of an industrial hygiene service in the State of Utah in 1939 has made it possible for the State industrial hygiene division to meet the present demands made on it by those industries now engaged in the production of vital defense materials. The services this unit is now rendering to these industries should add greatly in eliminating one of the most serious bottlenecks in our defense program, namely, the time lost due to disabilities of all types, which even under normal conditions exact a heavy toll in health, wages, and production.

A STRAIN OF ROCKY MOUNTAIN SPOTTED FEVER VIRUS OF LOW VIRULENCE ISOLATED IN THE WESTERN UNITED STATES [1]

By NORMAN H. TOPPING, *Passed Assistant Surgeon, United States Public Health Service*

Early in 1940 Topping and Dyer (*1*) reported the isolation of a highly virulent strain of Rocky Mountain spotted fever virus in the eastern United States. They stated, "It is, of course, possible that

[1] From the Division of Infectious Diseases, National Institute of Health.

there may be strains of virus in Montana which will produce in guinea pigs the picture usually associated with eastern strains, although reports of such are not found in the literature." It is the purpose of this paper to report, briefly, the isolation of such a strain from the western United States.

On May 23, 1940, a patient, "E. L.," was seen in a Denver, Colo., hospital. He had been in Wyoming near Lander,[3] having arrived in Denver on May 20. On this day a tick was found embedded in an old appendectomy scar. The tick was removed that evening by a local physician. On the evening of May 21 he had severe chills, headache, muscular pains, and, he believed, fever. The next morning he was admitted to the hospital. On May 23 the patient had a fever of 103.4° F., an early maculo-papular rash, most noticeable about the wrists and forearms, and on the inner surface of the heel and instep of the left foot. Blood was drawn and allowed to clot; this was macerated in sterile saline and the equivalent of about 4 cc. of whole blood was inoculated intraperitoneally into each of two guinea pigs. After a suitable incubation period one of these guinea pigs developed fever and from this pig the "L" strain of Rocky Mountain spotted fever was established. Other than for the early isolation, all of the observations have been made at the National Institute of Health, Washington, D. C.

The "L" strain has reacted in guinea pigs comparably in every way to the many strains isolated in the East. As pointed out by Topping and Dyer, Rocky Mountain spotted fever strains in guinea pigs can be compared on the basis of (1) incubation period, (2) scrotal involvement, and (3) fatality rates. The "L" strain has an incubation period appreciably longer than highly virulent strains, there has been no evidence of any consistent scrotal involvement in the infected guinea pigs, and there have been but very few deaths in the group. Since the original isolation, the strain has been passed through 25 generations of guinea pigs, a total of 191 having been used up to the time of this report. Of these, 56 were sacrificed either for transfer or pathological examination. There were 6 deaths in the remaining 135 guinea pigs, a fatality rate of 4.4 percent. This rate is considerably lower than that for the mildest strain so far isolated in the East and reported. That strain had a fatality rate of 8 percent (*2*).

Routine cross-immunity tests have been done and this "L" strain gives complete cross-immunity with the "B. R." strain of spotted fever and with our "W" strain reported previously (*1*). There is no cross-immunity to epidemic or endemic typhus, or to our passage strains of "Q" fever.

---

[3] Lander, Wyo., is located well within the so-called *D. andersoni* territory, and in a personal communication from R. A. Cooley, Entomologist, Rocky Mountain Laboratory, Hamilton, Mont., the statement is made, "We have no actual records of *D. variabilis* occurring in Wyoming."

The lengthened incubation period, lack of scrotal involvement, and a negligible fatality rate in the guinea pigs certainly places this strain of spotted fever in the group exhibiting a very low virulence for these animals. In these three most important differential characteristics, then, the "L" strain is indistinguishable from the usual strains isolated in the East.

DISCUSSION

It has long been the popular conception that Rocky Mountain spotted fever is a more virulent and, therefore, a more highly fatal disease in the West than in the East. Until comparatively recently observations in the laboratory lent support to this belief, because the isolated and reported western strains were more highly virulent for guinea pigs. Various reasons for this greater virulence have been propounded, one of the most popular being the vector in which the infectious agent resides, *D. andersoni* in the West and *D. variabilis* in the East. During the past year, however, some doubt has been cast upon this theory since a highly pathogenic strain of Rocky Mountain spotted fever has been isolated in *D. variabilis* territory in the East from which *D. andersoni* has never been reported; and now a strain of very low virulence has been recovered from a patient who acquired the tick in *D. andersoni* territory in the West, from which *D. variabilis* has never been reported.

In the East there are strains of spotted fever highly virulent for guinea pigs and strains of low virulence; in the West the same variations in virulence are to be found. There may, however, be a predominance of highly pathogenic strains in any given locality. This has been observed in the West, clinically, for years. In the East there may be areas in which the disease is more virulent with correspondingly higher fatality rates.

SUMMARY

A strain of Rocky Mountain spotted fever virus of low virulence isolated in the western United States is reported. It is suggested that the geographical classification (i. e., eastern or western type) be dropped. In the future, strains of Rocky Mountain spotted fever should be classified with reference to their virulence for guinea pigs.

REFERENCES

(*1*) Topping, N. H., and Dyer, R. E.: A highly virulent strain of Rocky Mountain spotted fever virus isolated in the eastern United States. Pub. Health Rep., **55**: 728 (April 26, 1940).

(*2*) Cooper, M. L., Kurzner, M. A., Wilson, A. T., and Dyer, R. E.: Report of two cases of Rocky Mountain spotted fever in Ohio. Pub. Health Rep., **53**: 1775 (Oct. 7, 1938).

AN ELECTROSTATIC METHOD FOR COLLECTING BACTERIA FROM AIR

By Clyde M. Berry, *Department of Hygiene and Preventive Medicine, State University of Iowa*

Dust may be removed from air with more or less efficiency by such methods as filtration, settling, washing, impingement, centrifuging, thermal precipitation, and electrostatic precipitation. With the exception of thermal and electrostatic precipitation all of these methods have been used for collecting bacteria from air.

At the present time in this country the two instruments commonly used in the bacteriologic examination of air are the Wells air centrifuge (*7*) and the Hollaender and DallaValle "funnel device" (*4*). The latter instrument makes use of the impingement principle and employs a Petri dish for culturing. Hollaender and DallaValle state (*1*): "It has been found to be efficient and to compare favorably with the Wells centrifuge, giving slightly higher results when the bacteria density is low."

STATEMENT OF PROBLEM

The immediate problem concerned the application of the electrostatic principle to the removal of bacteria from the air in such a manner that the sampling instrument might have value in the bacteriologic examination of air. Second, an attempt was made to ascertain the relative efficiency of this electrostatic method as compared with one of the accepted instruments used in determining the bacterial contamination of air.

Of the instruments now being used in this field it appeared that the electrostatic method might best be applied to the Hollaender and DallaValle "funnel device." To the impingement effect utilized by this instrument would thus be added the additional forces attributable to the electrostatic principle and possibly a more efficient sampling device would be made available. A schematic drawing of the apparatus is shown in figure 1. Details of construction are given in the appendix.

Any particle which enters the funnel stem of the electrostatic device and reaches any point between the ionizer and the agar tends to be removed from the air and precipitated on the culture medium by the combined effects of impingement, electric wind, and electrostatic attraction.

The particle is first subjected to the impingement effect resulting from a lateral change in the direction of the air flow within the apparatus. Inertia does not permit a particle of perceptible mass to change directions as easily as a gas and it may strike upon the moist surface of the agar and be held.

Second, the particles are swept toward the agar with the electric wind whose direction is from the ionizer to the agar. This is the more important effect resulting from the use of the electrostatic method.

According to Gibbs (*2*) the ions that are formed at the ionizer move at high speed toward the oppositely charged surface. The stream of rapidly moving ions charges the suspended particles and also, by the impact, drives the particles to this oppositely charged surface. The ions, molecules, and suspended particles that are subjected to such an acceleration exert a frictional drag on the air molecules in this region of high potential and tend to carry them along, thus producing the electric wind.

Third, they are subjected to the accelerating effect experienced by any charged particle that is in a region of high potential difference.

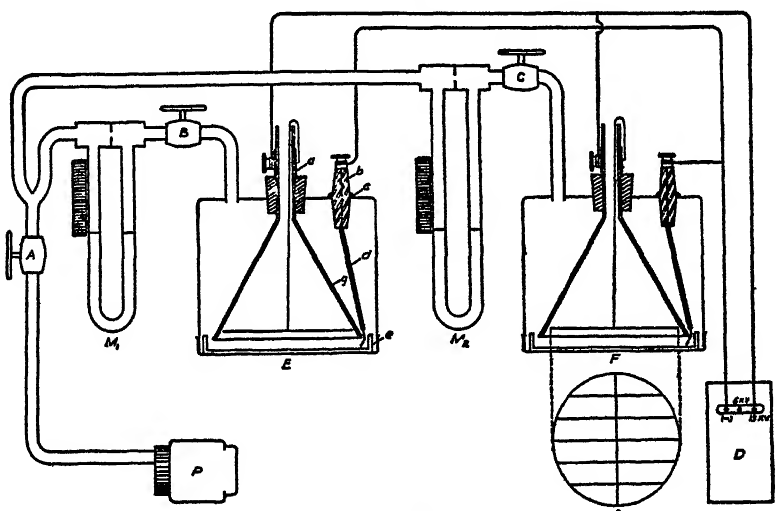


FIGURE 1.—"Funnel device" as modified for the electrostatic method (a) Metallic collar and binding post. (b) Porcelain portion of automobile spark plug (c) Soldered junction between spark plug and container. (d) Automobile high tension cable (e) Petri dish. (f) Ionizer, end view. (g) Glass funnel. (A, B, C) Valves (E) Funnel device, modified for electrostatic separation of bacteria from air. (F) Ionizer, side view. (M_1, M_2) Manometers. (P) Vacuum pump.

Gibbs considers the mobility of the charged particle in the field of high potential as being too small for effecting precipitation of the particles and concludes that the particles are deposited mainly by the electric wind that is set up between the two electrodes.

SAMPLING PROCEDURE

An artificially contaminated atmosphere has been used for testing the relative efficiency of this new principle. *Serratia marcescens* (*B. prodigiosus*) was used as the test organism. Forty-eight-hour cultures grown in nutrient broth were diluted with an equal quantity

of sterile normal saline and sprayed by compressed air into the air current produced by an electric fan. Such a procedure served to mix the air so that a homogeneous medium would be present at the time of sampling. After spraying, the fan was turned off and the room was left unoccupied and undisturbed for a settling period, allowing the larger droplets to be removed from the air by gravity. The settling time varied from several minutes to several hours. At the end of the settling period the fan was started and kept in operation during the sampling time in order to insure thorough mixing.

It was planned originally to use both the "funnel device" and the Wells air centrifuge to test the relative efficiency of the electrostatic can. However, it has been pointed out by Rooks, Cralley, and Barnes (*6*) that changes affecting the intake of the Wells air centrifuge make both the manometer and tube readings unreliable.

The relative efficiency of this new device was determined in terms of the "funnel device." In making this comparison and in order to develop maximum efficiency some of the factors considered were the depth that the funnel extends into the Petri dish, the polarity of the current, the distance of the ionizer from the agar, and the effect of humidity and ozone production.

DISCUSSION AND RESULTS

Hollaender and DallaValle reported the efficiency of their "funnel device" to be 80 percent (*4*). In determining this efficiency, four funnel devices were used in series. They found that of the total number of bacteria recovered 80 percent were in the first can, 15 percent in the second, and 5 percent in the third. The numbers caught on the fourth were negligible.

That the term "efficiency" used in the preceding paragraph must be considered as having a relative rather than an absolute value is indicated by the following experiment:

Three funnel devices were connected in series. An electrostatic can was attached to the exhaust of the *last* funnel device of the series. Forty-eight readings were taken, and in each instance more organisms were recovered by the electrostatic device than were recovered in the first funnel device of the series. On the basis of this comparison, the absolute efficiency of the first funnel device of the series cannot be greater than 50 percent.

Three electrostatic devices were next connected in a similar series. Of the total number of bacteria recovered, between 94 and 97 percent were found in the first electrostatic can. A "funnel device" attached to the exhaust of a single electrostatic can recovered less than 2 percent in the series of 12 samples that were taken.

These experiments indicate that the electrostatic device, either singly or in series, is more efficient that the unmodified funnel device.

It would appear, however, that the determination of the absolute efficiency of any such device for the sampling of air for bacteria is impractical. If a different device is used in testing it may be less effective than the one under test. If a number of the same devices are used in series, there is no valid reason for assuming that bacteria escaping the first will be caught by the succeeding ones.

Figure 2 shows the results of a further series of samples comparing the Hollaender and DallaValle "funnel device" with the electrostatic method. On the ordinate is given the time in minutes after the end of the spraying period. On the abscissa are the numbers of bacteria

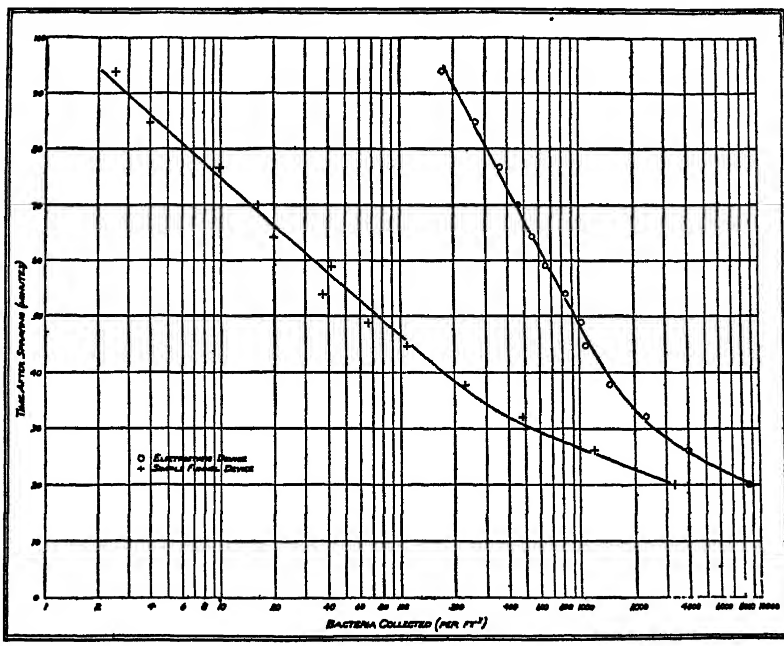


FIGURE 2.—Comparison of the electrostatic and impingement methods for collecting bacteria from air.

per cubic foot as determined by the two instruments. The graph demonstrates, first, that the separation is consistently greater with the use of the electrostatic set-up, and second, that this effectiveness assumes greater importance as the time after spraying increases. At 20 minutes after spraying the electrostatic device was about 3 times as effective as the simple funnel device and at 94 minutes it was more than 70 times as effective.

It is of interest to note that after 40 minutes both instruments demonstrate the straight line feature of the logarithmic death rate curve for bacteria.

The slope of the curve for the simple funnel device indicates that no bacteria, or at least very few, would be recovered by the device after

105 minutes. In the same way no bacteria would be expected to be recovered by the electrostatic device after 230 minutes.

Figure 2 shows the results of a single group of successive samples and is given as an illustration of the sampling differences which may occur with the use of the two instruments. During this sampling period the temperature was 82° F. and the relative humidity was 40 percent.

Obviously in no two such sampling series can the conditions be identical throughout. Initial bacterial load of the air cannot be exactly duplicated; nuclei size will vary with temperature and humidity, and the viability of the organisms may differ from culture to culture.

It has been found that the two main factors affecting the efficiency of the instrument are, first, the apparatus has been found to give slightly better results if the ionizer is kept at a positive potential, and second, at excessively high artificially produced humidities (over 85 percent) the current leakage from the electrostatic device is so great that its effectiveness is materially reduced.

The ionizer should be as close as possible to the agar without producing sparking. If the funnel is within the lip of the Petri dish, varying the distance of this funnel from the agar does not appear to change the efficiency. Kraus (*5*) found that voltages between 71,900 and 76,800 had no deleterious effect on liquid suspensions of Gram positive, Gram negative, spore-forming, or non-spore-forming bacteria. It seems unlikely, therefore, that 12,000 volts would be appreciably germicidal.

Ozone is produced in the operation of the electrostatic apparatus. At no time has the exhaust air reached an ozone concentration that is objectionable when breathed. Witheridge and Yaglou (*8*) have determined this objectionable concentration to be 0.10 part of ozone per million parts of air. Hartman (*3*) states that the ozone concentration must reach 6,500 parts per million to be germicidal to air-borne organisms. We feel safe, therefore, in assuming that the concentration of ozone does not reach germicidal concentrations within the apparatus.

However, ozone production should be kept at a minimum at all times to limit the rate of oxidation of the metal portions of the apparatus and of the rubber connections. This oxidative process makes it necessary to use platinum or other nonoxidizable wires in the construction of the ionizer. In the initial experiments new copper wires were used in construction, and within a few weeks the effectiveness of the instrument had decreased by half owing to corrosion.

SUMMARY AND CONCLUSIONS

The electrostatic method has been applied to the Hollaender and DallaValle "funnel device" for the bacteriologic examination of air. Pertinent structural changes in the "funnel device" for the application of the electrostatic method are given in detail.

A series of 512 readings using *B. prodigiosus* as a test organism under varying test situations appears to justify the following conclusions:

1. Bacteria may be removed from air electrostatically to a solid medium where they may be cultured and counted by recognized laboratory techniques.
2. The electrostatic method when applied to the "funnel device" of Hollaender and DallaValle shows a greater relative sampling efficiency.
3. This relative efficiency becomes greater with the elapse of time after spraying.
4. The apparatus has been found to give slightly better results if the ionizer is kept at a positive potential.
5. At excessively high artificially produced humidities (over 85 percent) the current leakage from the electrostatic device is so great that its effectiveness is materially reduced.

A device such as the Mine Safety Appliances electrostatic precipitator might be adapted to make both current and suction available in a portable unit, as suggested in the appendix.

REFERENCES

(*1*) DallaValle, J. M., and Hollaender, A.: The effectiveness of certain types of commercial air filters against bacteria (*B. subtilis*). Pub. Health Rep., 54: 695–699 (1939).

(*2*) Gibbs, E.: Clouds and Smokes. P. Blakiston Son & Co., Philadelphia, 1924. Pp. 80–83.

(*3*) Hartman, F. E.: The industrial application of ozone. American Society of Heating and Ventilating Engineers J., 30: 711–727 (1924).

(*4*) Hollaender, A., and DallaValle, J. M.: A simple device for sampling air-borne bacteria. Pub. Health Rep., 54: 574–577 (1939).

(*5*) von Kraus, K.: Bakterien im Elektrischen Kraftfeld. Zntr. f. Bakt., Abt. 1, 124: 64–77 (1932).

(*6*) Rooks, R., Cralley, L. J., and Barnes, M. E.: Hospital masks: Their bacterial filtering efficiency and resistance to air flow. A comparative study. Pub. Health Rep., 56: 1411–1419 (1941).

(*7*) Wells, W. F.: Apparatus for the study of the bacterial behavior of air. Am. J. Pub. Health, 23: 58–59 (1933).

(*8*) Witheridge, W. N., and Yaglou, C. P.: Ozone in ventilation—its possibilities and limitations. Heating and Piping and Air Conditioning, 11: 648–652 (1939).

Appendix

Construction.—The porcelain portion of an automobile spark plug (b) is fitted to the "funnel device" as follows: The upper and lower copper washers on the plug are fastened together by fine copper wire

(No. 36 gauge was found to be satisfactory). Copper wire of the same size is then wrapped in close spirals around the porcelain between the two washers. Solder may then be melted over this area, the net result being a metal band around the porcelain which may be soldered to the metal container and become an integral part of the apparatus. Opposite the exhaust outlet is the most convenient position. A 3-inch portion of automobile high tension cable is soldered to the bottom point of the spark plug and the junction wrapped with a small piece of electrician's linen high tension tape.

The ionizer (F and f) is made by constructing a circular framework 2¾ inches in diameter of heavy wire (No. 14 gauge copper). A short section of smaller copper wire (No. 36) is soldered across the diameter of the circular framework and a longer section of the same size wire is attached to the center of this cross wire and extends up the stem of the funnel, reverses direction, and is soldered to the metal collar (a). The collar fits the stem of the funnel closely but may be moved up or down and in this way the distance of the ionizer from the agar may be varied. A binding post on the collar provides facilities for connecting the ionizer to the source of current.

Trial experiments have shown that a centering device for the vertical wire of the ionizer is unnecessary. The use of such an arrangement insures exact vertical adjustment of the ionizer but at the same time it disturbs the uniform flow of air through the funnel stem. The effectiveness of the apparatus is not altered by the slight lateral displacement of the ionizer which occurs with a change in the position of the collar (a).

The parallel wires of the ionizer are of platinum, No. 64 gauge, and are placed across the circular framework perpendicular to the copper cross wire and approximately one-fourth inch apart. The glass funnel effectively insulates the ionizer at all points from the rest of the can.

Orifice meters are used to measure the rate of air flow. The connections are of rubber tubing. Valves A, B, and C are screw-type pinch cocks which permit individual as well as over-all adjustment of the rates of air flow.

Suction is provided by a suitable vacuum pump, capable of creating a constant air flow.

The power pack (D) produces direct current at 6,000 and 12,000 volts.

Suitable lengths of high tension automobile cable effectively handle the current from the power pack. The terminals at the pack are semipermanent and enclosed; those to the can are of the flat, notched type that attach readily to the spark plug and ionizer binding post. Soldered construction has been used wherever possible in order to insure good electrical contact and mechanical stability.

Operation.—The first step in the operation of the device is to adjust valves A, B, and C to the desired rate of air flow. During this process the containers are closed and no plates are used. The electrical connections are made at this time.

The plates to be used are poured a little heavier than is the custom and they are allowed to harden completely before use. This insures good electrical contact, a better distribution of the colonies on the plate, and a reduced tendency toward sparking.

The lid is then removed from the can and the negative terminal (d) is inspected for cleanliness. A corroded terminal or one coated with dried agar will not make good electrical contact. A poured plate is set on the lid and the lid replaced.

The current is now turned on momentarily to test for sparking or short circuits. If sparking occurs the current is turned off and the ionizer (f) raised by lowering the collar (a). After the optimum distance of the ionizer has been determined it is rarely necessary to change its position. For maximum effectiveness it should be as close to the agar as is possible without sparking.

After the ionizer has been adjusted and the current conditions are satisfactory the motor is set into operation for a definite period of time and the air rate noted. The product of air rate and the time is the volume of air sampled.

When the desired amount of air has been sampled the current and motor are turned off and the plate removed. A fresh plate is then inserted as before and another sample taken.

It will be seen from the drawing that it is possible to operate both cans under identical conditions or to vary such items as the rate of air flow, the depth that the funnel extends into the Petri dish, the voltage used, the polarity of the current, or the distance of the ionizer from the agar.

A device such as the Mine Safety Appliances electrostatic precipitator might be adapted to make both current and suction available in a portable unit.

DISABLING MORBIDITY AMONG INDUSTRIAL WORKERS, SECOND QUARTER OF 1941, WITH A NOTE ON THE OCCURRENCE OF PNEUMONIA AMONG IRON AND STEEL WORKERS[1]

By W. M. Gafafer, *Senior Statistician, United States Public Health Service*

The accompanying data are derived from periodic reports on sickness and nonindustrial injuries causing disability lasting more than 1 week among over 200,000 male members of industrial sick benefit associations, group insurance plans, and company relief departments.

Second quarter and first half of 1941.—Table 1 shows the frequency of disabilities per 1,000 male industrial workers for the second quarter and first half of the year 1941. While the frequencies for all sickness show no sensible changes for the second quarter and the first half of 1941 as compared with the corresponding frequencies for 1940, there are several causes for which increases in frequency are notable. For the second quarter these causes are bronchitis, diseases of the pharynx and tonsils, pneumonia, and infectious and parasitic diseases; for the first half the causes are influenza and grippe, reflecting the epidemic of the first quarter of 1941, and pneumonia. A review of the corresponding rates for the second quarter of each year since 1932 reveals that the rates for the second quarter of 1941 for bronchitis, diseases of the pharynx and tonsils, and pneumonia are the highest, the percentage excesses in relation to the corresponding 10-year means being, respectively, 36, 35, and 77 percent.

Pneumonia among iron and steel workers.—The magnitude of the pneumonia frequency indicates the desirability of further examination of the pneumonia experience. When the workers are separated into those engaged in iron and steel work and those not so engaged, it is found that the frequency of pneumonia per 1,000 iron and steel workers for the second quarter has increased from 3.4 in 1939 to 3.8 in 1940, and to 5.7 in 1941, the corresponding frequencies for workers not engaged in this work showing a tendency to decrease, as follows, 3.1 to 3.0 to 2.9.

The relatively large increase in the frequency of pneumonia among iron and steel workers shown by the rates for the second quarters of 1940 and 1941 may be attributable to the large influx of new employees, the population change for the two second quarters representing an increase of over 30 percent; among workers not employed in the iron and steel industry, on the other hand, the corresponding population change represents a decrease of 4 percent.

---

[1] From the Division of Industrial Hygiene, National Institute of Health. The preceding report of this series, "Frequency of disabling morbidity by cause, and duration, among male and female industrial workers during 1940, and by cause among males during the first quarter of 1941," by W. M. Gafafer, appeared in the Public Health Reports, vol. 56, pp. 1848–1852, September 12, 1941.

TABLE 1.—*Frequency of disabling cases of sickness and nonindustrial injuries lasting 8 consecutive calendar days or longer among MALE employees in various industries, by cause, the second quarter of 1941 compared with the second quarter of 1940, and the first half of 1941 compared with the first halves of the years 1936–40, inclusive*

Cause (numbers in parentheses are disease title numbers from the International List of Causes of Death, 1939)	Annual number of cases per 1,000 males				
	Second quarter		First half		
	1941	1940	1941	1940	1936–40
Sickness and nonindustrial injuries [1]	87.7	87.7	112.9	111.1	104.7
Nonindustrial injuries (169–195)	10.1	10.3	10.8	11.4	10.7
Sickness [1]	77.6	77.4	102.1	99.7	94.0
Respiratory diseases	33.2	30.6	55.7	50.1	45.7
Influenza and grippe (33)	10.3	11.8	30.1	25.5	24.0
Bronchitis, acute and chronic (106)	4.9	4.1	6.3	6.4	5.5
Diseases of the pharynx and tonsils (115b, 115c)	7.4	5.8	6.5	5.9	5.6
Pneumonia, all forms (107–109)	4.6	3.5	5.2	4.8	3.8
Tuberculosis of the respiratory system (13)	.7	.6	.6	.7	.8
Other respiratory diseases (104, 105, 110–114)	5.3	4.8	7.0	6.8	6.0
Nonrespiratory diseases	41.8	45.1	43.6	47.6	45.9
Digestive diseases	13.2	15.0	13.8	15.2	14.1
Diseases of the stomach, except cancer (117, 118)	3.3	3.8	3.6	3.9	3.9
Diarrhea and enteritis (120)	.9	1.3	1.0	1.3	1.1
Appendicitis (121)	4.7	5.3	4.9	5.4	4.6
Hernia (122a)	1.6	1.9	1.6	1.7	1.7
Other digestive diseases (115a, 115d, 116, 122b, 123–129)	2.7	2.7	2.7	2.9	2.8
Nondigestive diseases	28.6	30.1	29.8	32.4	31.8
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	3.8	4.2	4.2	4.7	4.5
Other genitourinary diseases (133–138)	2.2	2.6	2.2	2.8	2.5
Neuralgia, neuritis, sciatica (87b)	1.9	2.7	2.0	2.8	2.4
Neurasthenia and the like (part of 84d)	.9	1.3	.9	1.2	1.1
Other diseases of the nervous system (80–85, 87, except part of 84d and 87b)	1.1	1.1	1.1	1.1	1.1
Rheumatism, acute and chronic (58, 59)	3.5	4.4	4.1	4.5	4.4
Diseases of the organs of locomotion, except diseases of the joints (156b)	2.9	2.6	2.9	3.0	2.9
Diseases of the skin (151–153)	2.3	2.1	2.3	2.6	2.7
Infectious and parasitic diseases [2] (1–12, 14–24, 26–29, 31, 32, 34–44)	3.1	1.9	2.8	2.1	2.9
All other diseases (45–57, 60–79, 88, 89, 100, 101, 103, 154, 155, 156a, 157, 162)	6.9	7.2	7.3	7.6	7.8
Ill-defined and unknown causes (200)	2.6	1.7	2.8	2.0	2.4
Average number of males covered in the record	229,739	199,311	226,712	198,038	870,500
Number of organizations	24	26	26	26	

[1] Exclusive of disability from the venereal diseases and a few numerically unimportant causes of disability.
[2] Except influenza, respiratory tuberculosis, and the venereal diseases.

DEATHS DURING WEEK ENDED OCTOBER 4, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Oct. 4, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,687	7,776
Average for 3 prior years	7,626	
Total deaths, first 40 weeks of year	336,370	337,467
Deaths per 1,000 population, first 40 weeks of year, annual rate	11.7	11.8
Deaths under 1 year of age	541	490
Average for 3 prior years	502	
Deaths under 1 year of age, first 40 weeks of year	20,998	20,067
Data from industrial insurance companies:		
Policies in force	64,506,975	64,812,208
Number of death claims	11,001	11,169
Death claims per 1,000 policies in force, annual rate	8.9	9.0
Death claims per 1,000 policies, first 40 weeks of year, annual rate	9.5	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 11, 1941

Summary

The incidence of poliomyelitis declined for the third consecutive week. A total of 429 cases was reported for the current week as compared with 456 for the preceding week and with 592 for the next earlier week. Slight increases were recorded in the North Central areas where the number of cases increased from 19 to 31 in Michigan, 18 to 25 in Illinois, 15 to 19 in Minnesota, and 0 to 6 in Kansas. The following named 9 States reported more than 15 cases (last week's figures in parentheses): New York, 79 (87); Pennsylvania, 42 (51); Michigan, 31 (19); New Jersey, 25 (22); Illinois, 25 (18); Ohio, 21 (32); Minnesota, 19 (15); Alabama, 17 (22); and Tennessee, 16 (27).

A total of 7,279 cases of poliomyelitis has been reported to date this year (first 41 weeks), as compared with a 5-year (1936–40) median of 5,664, and with 7,435 and 8,433 cases for the corresponding period in 1940 and 1937, respectively.

The current incidence of influenza, measles, poliomyelitis, and whooping cough is above the 5-year median, and the numbers of cases of these diseases reported to date this year exceed the 5-year cumulative medians for the same period.

Of 995 cases of influenza, 361 were reported in Texas, 200 in South Carolina, and 114 in Virginia.

Sixty-two cases of typhoid fever were reported in Virginia, as compared with 7 cases for the preceding week. Of 84 cases of endemic typhus fever, 31 cases occurred in Georgia, 15 in Texas, and 11 in Louisiana.

The crude death rate for the current week for 88 large cities in the United States is 10.9 per 1,000 population, the same as the 3-year (1938–40) average for the corresponding week. The rate for the preceding week was 10.7 and for the next earlier week, 10.3. The cumulative rate to date is 11.7 as compared with 11.8 for the same period last year.

Telegraphic morbidity reports from State health officers for the week ended October 11, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940	
NEW ENG.												
Maine	0	2	1	------	------	------	50	24	8	0	0	0
New Hampshire	0	0	0	------	------	------	1	0	2	0	0	0
Vermont	0	0	0	------	------	------	0	5	5	0	0	0
Massachusetts	2	2	2	------	------	------	57	107	43	8	2	2
Rhode Island	1	0	0	------	------	------	5	0	2	0	0	0
Connecticut	0	1	2	6	1	------	24	8	6	0	0	0
MID. ATL.												
New York	17	12	18	[1] 8	[1] 7	[1] 7	76	99	68	8	8	4
New Jersey	2	12	10	12	1	8	24	60	19	0	0	0
Pennsylvania [3]	12	16	30	1	------	------	86	93	66	2	1	3
E. NO. CEN.												
Ohio [3]	11	15	30	6	9	9	23	6	10	0	2	2
Indiana	11	5	21	6	2	13	5	9	11	1	2	2
Illinois	20	12	35	8	3	3	13	61	19	1	0	2
Michigan [4]	7	10	14	------	12	2	57	113	26	1	0	2
Wisconsin	0	8	3	19	27	25	40	105	21	0	1	1
W. NO. CEN.												
Minnesota	3	4	4	2	2	2	8	4	8	0	0	0
Iowa	2	8	7	------	------	------	8	11	7	0	0	1
Missouri	7	6	14	1	------	20	14	2	8	0	0	0
North Dakota	2	3	2	7	1	1	18	4	2	0	0	0
South Dakota	12	2	2	------	------	------	2	2	2	1	1	0
Nebraska	2	1	1	------	2	------	2	16	4	0	0	0
Kansas	2	5	5	1	3	2	4	7	4	0	1	1
SO. ATL.												
Delaware	1	0	1	------	------	------	2	4	2	0	0	0
Maryland [2, 4]	7	4	7	3	2	7	10	5	5	2	0	1
Dist. of Col.	2	2	6	2	------	------	7	2	2	0	0	0
Virginia [2]	37	31	61	114	45	45	24	22	11	1	2	2
West Virginia	5	7	19	11	2	9	49	5	2	0	0	2
North Carolina [2]	59	71	124	------	------	1	34	4	32	1	0	1
South Carolina [2]	50	20	24	200	168	168	76	2	3	3	0	1
Georgia [2]	45	28	48	13	14	14	14	3	3	0	1	1
Florida [2]	5	3	8	10	------	------	1	1	1	1	0	1
E. SO. CEN.												
Kentucky	16	7	24	------	2	3	7	12	14	2	1	1
Tennessee [2]	23	8	34	8	6	10	28	15	6	1	1	3
Alabama [2]	28	29	43	10	13	23	25	2	3	0	2	2
Mississippi [2, 4]	17	11	18	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas [2]	16	16	19	8	14	14	31	2	1	1	0	0
Louisiana [2]	10	14	17	3	------	5	1	5	2	2	1	1
Oklahoma	14	16	16	44	38	28	7	5	1	0	1	1
Texas [2]	43	22	34	361	195	140	11	11	15	0	0	1
MOUNTAIN												
Montana	2	1	1	------	20	20	11	17	22	0	0	0
Idaho	0	0	0	------	5	5	1	3	7	0	0	0
Wyoming	2	1	0	1	------	------	4	1	1	0	0	0
Colorado	9	8	9	50	13	6	18	9	6	0	0	0
New Mexico	0	0	2	2	------	------	4	9	9	0	1	0
Arizona	0	1	4	47	65	27	35	21	2	0	0	0
Utah [4]	0	2	1	1	2	1	8	3	6	0	0	0
Nevada	0	0	------	------	------	------	0	0	------	0	1	------
PACIFIC												
Washington	0	0	0	------	------	------	9	2	15	0	0	0
Oregon	1	6	0	7	15	13	9	11	5	1	0	0
California	12	16	22	28	16	16	101	57	42	0	0	1
Total	517	433	753	995	705	687	1,039	964	961	27	24	42
41 weeks	10,705	11,215	18,650	573,309	173,817	155,313	837,282	234,393	272,877	1,645	1,366	2,405

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 11, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940		Oct. 11, 1941	Oct. 12, 1940	
NEW ENG.												
Maine	4	0	0	10	0	7	0	0	0	3	2	2
New Hampshire	1	1	0	2	2	2	0	0	0	0	0	0
Vermont	0	1	0	1	7	7	0	0	0	0	0	0
Massachusetts	13	3	3	92	45	60	0	0	0	5	0	0
Rhode Island	2	1	0	7	2	5	0	0	0	0	0	0
Connecticut	5	0	2	18	10	19	0	0	0	1	0	1
MID. ATL.												
New York	79	8	9	90	107	121	0	0	0	16	14	20
New Jersey	25	2	4	30	38	38	0	0	0	7	5	4
Pennsylvania [2]	42	18	7	94	85	165	0	0	0	13	14	26
E. NO. CEN.												
Ohio [2]	21	38	18	100	93	171	0	0	0	12	7	8
Indiana	2	31	5	82	83	75	0	2	2	3	4	4
Illinois	25	43	16	75	150	192	0	3	2	8	17	19
Michigan [4]	31	64	18	74	80	156	1	0	0	5	4	7
Wisconsin	5	25	9	68	80	89	0	0	0	0	0	1
W. NO. CEN.												
Minnesota	19	20	20	43	57	57	0	0	0	0	2	2
Iowa	0	75	11	33	24	56	0	1	1	3	2	6
Missouri	2	26	5	25	32	45	2	0	0	11	10	16
North Dakota	1	0	0	18	12	23	0	0	0	0	1	1
South Dakota	1	1	1	13	9	14	0	0	0	3	0	0
Nebraska	0	20	2	16	4	8	0	0	0	1	1	1
Kansas	6	24	6	37	62	62	0	1	0	2	2	4
SO. ATL.												
Delaware	5	0	0	8	2	7	0	0	0	2	0	1
Maryland [2] [4]	9	0	2	25	27	27	0	0	0	9	5	5
Dist. of Col.	3	0	1	11	5	7	0	0	0	0	1	2
Virginia [2]	11	15	1	39	25	35	0	0	0	62	7	10
West Virginia	5	37	1	38	31	63	0	0	0	10	5	9
North Carolina [2]	8	1	1	57	118	80	0	0	0	5	12	12
South Carolina [2]	8	0	0	13	54	10	0	0	0	3	5	10
Georgia [2]	6	1	1	23	42	32	0	0	0	16	11	11
Florida [2]	6	1	1	6	8	8	0	0	0	1	0	2
E. SO. CEN.												
Kentucky	8	6	4	53	55	55	0	0	0	17	15	15
Tennessee [2]	16	3	3	42	53	48	0	0	0	12	14	14
Alabama [2]	17	3	2	32	20	20	0	0	0	8	3	4
Mississippi [2] [4]	6	2	2	17	8	13	0	0	0	4	1	5
W. SO. CEN.												
Arkansas [2]	1	1	1	13	15	15	1	0	0	6	15	11
Louisiana [2]	7	3	1	8	7	8	0	0	0	15	8	8
Oklahoma	2	4	2	13	28	27	1	0	1	4	5	8
Texas [2]	5	4	4	29	32	32	0	1	0	------	17	27
MOUNTAIN												
Montana	0	3	2	8	12	22	0	1	4	0	1	3
Idaho	0	2	0	12	13	16	0	0	0	0	10	3
Wyoming	1	0	0	9	4	5	0	0	0	0	1	1
Colorado	0	0	3	5	11	16	0	0	0	4	0	6
New Mexico	0	0	2	8	3	8	0	0	0	2	3	7
Arizona	0	2	2	3	4	4	0	0	0	1	1	3
Utah [4]	2	3	3	8	3	10	0	0	0	0	0	0
Nevada	0	1	------	0	0	------	0	0	------	7	0	------
PACIFIC												
Washington	6	18	4	12	28	30	0	0	1	2	3	3
Oregon	5	1	2	3	7	20	0	1	1	0	2	1
California	8	10	10	84	89	98	0	0	1	5	6	9
Total	429	517	306	1,466	1,654	1,990	5	10	23	283	236	341
41 weeks	7,279	7,435	5,664	99,490	127,266	148,754	1,221	2,046	8,456	7,014	7,929	11,436

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 11, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough—Week ended Oct. 11, 1941	Whooping cough—Week ended Oct. 12, 1940
NEW ENG.		
Maine	4	5
New Hampshire	13	0
Vermont	12	4
Massachusetts	99	110
Rhode Island	19	3
Connecticut	37	65
MID. ATL.		
New York	297	281
New Jersey	89	78
Pennsylvania [2]	239	381
E. NO. CEN.		
Ohio [3]	176	206
Indiana	6	12
Illinois	176	139
Michigan [4]	434	348
Wisconsin	191	95
W. NO. CEN.		
Minnesota	56	36
Iowa	31	11
Missouri	6	26
North Dakota	13	23
South Dakota	22	2
Nebraska	5	2
Kansas	29	30
SO. ATL.		
Delaware	3	14
Maryland [2 4]	36	51
Dist. of Col	17	4
Virginia [2]	29	40
West Virginia	30	25
North Carolina [2]	69	65
SO. ATL.—continued		
South Carolina [2]	60	12
Georgia [2]	10	8
Florida [2]	5	9
E. SO. CEN.		
Kentucky	91	87
Tennessee [2]	49	33
Alabama [2]	6	12
Mississippi [2 4]		
W. SO. CEN.		
Arkansas [2]	2	29
Louisiana [2]	3	2
Oklahoma	4	15
Texas [2]	52	90
MOUNTAIN		
Montana	8	0
Idaho	2	1
Wyoming	4	2
Colorado	40	19
New Mexico	24	4
Arizona	16	2
Utah [4]	28	8
Nevada	6	0
PACIFIC		
Washington	42	12
Oregon	45	2
California	197	248
Total	2,832	2,600
41 weeks	171,713	128,172

[1] New York City only.
[2] Typhus fever, week ended Oct. 11, 1941, 84 cases, as follows: Pennsylvania, 1; Maryland, 1; Virginia, 1; North Carolina, 2; South Carolina, 4; Georgia, 31; Florida, 3; Tennessee, 4; Alabama, 7; Mississippi, 2; Arkansas, 2; Louisiana, 11; Texas, 15.
[3] Rocky Mountain spotted fever, week ended Oct. 11, 1941, Ohio, 1 case.
[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended September 27, 1941

This table lists the reports from 134 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	5	0	0	0	0	6	20
New Hampshire:											
Concord	0	------	0	0	0	2	0	0	0	0	9
Manchester	0	------	0	0	0	0	0	0	0	0	5
Nashua	0	0	0	0	1	0	0	0	0	5	9
Vermont:											
Barre	0	------	------	1	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	0	4	6	16	0	5	2	27	140
Fall River	2	------	0	0	0	7	0	1	1	0	23
Springfield	0	------	0	13	2	8	0	0	0	8	43
Worcester	0	------	0	0	4	3	0	1	0	15	45
Rhode Island:											
Pawtucket	0	------	------	0	------	0	0	------	0	0	------
Providence	2	------	0	1	0	1	0	1	0	30	44
Connecticut:											
Bridgeport	0	1	1	1	1	1	0	1	1	0	34
Hartford	0	------	0	1	0	2	0	0	0	3	26
New Haven	1	------	0	2	0	1	0	0	0	7	39
New York:											
Buffalo	0	------	0	1	6	9	0	6	0	11	105
New York	5	------	0	14	44	30	0	59	5	214	1,253
Rochester	0	------	0	1	2	0	0	0	0	3	54
Syracuse	0	------	0	0	2	0	0	0	0	18	40
New Jersey:											
Camden	1	------	0	0	0	1	0	0	3	3	25
Newark	0	1	0	4	1	6	0	13	0	40	98
Trenton	0	------	0	0	4	2	0	1	0	0	32
Pennsylvania:											
Philadelphia	4	2	0	2	11	7	0	18	3	41	379
Pittsburgh	3	------	0	1	6	7	0	7	0	25	165
Reading	0	------	0	0	1	1	0	0	0	1	35
Scranton	0	------	------	0	------	0	0	------	0	0	------
Ohio:											
Cleveland	0	1	0	1	5	8	0	8	0	45	158
Columbus	0	------	0	1	2	4	0	3	0	9	75
Toledo	0	------	0	1	2	2	0	3	0	29	63
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	9
Fort Wayne	0	------	0	0	2	4	0	0	0	0	16
Indianapolis	1	------	0	1	11	1	0	1	0	13	93
Muncie	0	------	0	0	0	0	0	0	0	4	7
South Bend	0	------	0	0	2	0	0	0	0	0	17
Terre Haute	1	------	0	0	1	0	0	0	0	0	14
Illinois:											
Alton	0	------	0	0	1	1	0	0	2	3	4
Chicago	6	1	0	9	18	32	0	31	1	110	633
Elgin	0	------	0	1	0	0	0	0	0	3	4
Moline	0	------	0	1	0	0	0	0	1	2	12
Michigan:											
Detroit	1	------	0	6	5	18	0	8	0	122	222
Flint	0	------	0	0	3	2	0	0	0	9	24
Grand Rapids	0	------	0	0	4	1	0	0	1	13	29
Wisconsin:											
Kenosha	0	------	0	0	0	3	0	0	0	2	6
Madison	0	------	0	3	0	2	0	0	0	4	6
Milwaukee	0	------	0	3	3	10	0	0	0	136	84
Racine	0	------	0	1	0	8	0	0	0	5	13
Superior	0	------	0	0	0	0	0	0	0	9	6
Minnesota:											
Duluth	0	------	0	0	0	0	0	1	0	4	25
Minneapolis	0	------	0	1	0	5	0	1	0	30	91
St. Paul	0	------	0	2	2	4	0	1	0	27	42
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	0	------
Davenport	0	------	------	0	------	3	0	------	0	0	------
Des Moines	0	------	0	1	0	5	0	0	0	0	34
Sioux City	0	------	------	0	------	0	0	------	0	1	------
Waterloo	0	------	------	0	------	2	0	------	0	0	------

City reports for week ended September 27, 1941—Continued.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0	------	0	0	4	2	0	3	2	0	97
St. Joseph	0	------	0	0	3	0	0	0	0	2	22
St. Louis	3	------	0	1	6	6	0	6	2	9	176
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	4	13
Grand Forks	0	------	------	0	------	0	0	------	0	5	------
Minot	0	------	0	1	0	0	0	0	0	3	4
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	2	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	6
Nebraska:											
Lincoln	0	------	------	2	------	1	0	------	0	1	------
Omaha	1	------	0	0	2	1	0	0	0	1	63
Kansas:											
Lawrence	0	4	0	0	1	0	0	0	0	2	5
Topeka	0	------	0	1	2	3	0	0	0	3	12
Wichita	0	------	0	0	2	2	0	2	0	0	24
Delaware:											
Wilmington	0	------	0	2	1	3	0	0	0	0	20
Maryland:											
Baltimore	1	1	0	3	8	10	0	12	1	34	194
Cumberland	0	------	0	0	0	0	0	1	1	0	15
Frederick	0	------	0	0	1	0	0	0	0	0	4
Dist. of Col.:											
Washington	0	------	0	3	5	6	0	12	4	24	206
Virginia:											
Lynchburg	3	------	0	0	4	0	0	1	1	1	9
Norfolk	0	------	0	0	2	1	0	1	1	2	37
Richmond	1	------	1	0	2	2	0	0	0	0	40
Roanoke	1	------	0	0	0	2	0	0	1	0	13
West Virginia:											
Charleston	0	------	0	0	0	2	0	0	0	1	7
Huntington	0	------	------	0	------	1	0	------	3	1	------
Wheeling	0	------	0	1	0	1	0	0	0	0	16
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	1	------	0	0	0	0	0	0	1	3	12
Wilmington	0	------	0	1	4	1	0	1	0	10	15
Winston-Salem	4	------	0	1	0	0	0	3	0	0	19
South Carolina:											
Charleston	0	10	0	0	2	0	0	0	3	1	22
Florence	3	------	0	0	1	0	0	0	0	0	10
Greenville	0	------	0	0	0	0	0	0	2	0	4
Georgia:											
Atlanta	0	6	0	0	0	3	0	2	0	0	57
Brunswick	0	------	0	0	0	0	0	0	0	0	4
Savannah	0	2	0	1	0	2	0	2	1	0	35
Florida:											
Miami	0	------	0	0	0	0	0	2	1	0	17
St. Petersburg	0	------	0	0	3	0	0	0	0	6	13
Tampa	0	------	0	0	0	0	0	1	0	3	18
Kentucky:											
Ashland	0	------	0	0	0	0	0	0	1	0	5
Covington	0	------	0	2	2	0	0	0	0	0	19
Lexington	0	------	0	0	0	1	0	0	0	1	12
Louisville	0	------	0	1	2	11	0	3	0	51	66
Tennessee:											
Knoxville	0	------	0	0	0	0	0	2	1	0	21
Memphis	0	------	0	0	1	2	0	3	1	7	80
Nashville	0	------	0	1	1	4	0	3	0	8	38
Alabama:											
Birmingham	2	3	0	0	5	4	0	1	2	1	66
Mobile	1	------	0	0	0	0	0	1	1	0	25
Montgomery	0	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	0	1	0	0	0	0	0	4	0	3	25
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	1	0	0	5
New Orleans	2	------	0	0	7	1	0	8	1	2	126
Shreveport	0	------	0	0	6	1	0	6	1	0	48
Oklahoma:											
Oklahoma City	0	------	0	0	3	0	0	2	1	1	32
Tulsa	0	------	0	1	2	1	0	1	0	4	22

City reports for week ended September 27, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Texas:											
Dallas	3	------	0	0	1	4	0	0	0	0	52
Fort Worth	5	------	0	0	2	1	0	1	0	7	38
Galveston	0	------	0	0	1	0	0	2	0	0	16
Houston	1	------	0	0	3	1	0	4	0	2	61
San Antonio	1	2	0	1	8	1	0	15	1	1	48
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	5
Great Falls	0	------	0	0	3	0	0	0	0	1	11
Helena	0	------	0	0	0	0	0	0	0	1	6
Missoula	0	------	0	0	1	0	0	0	0	0	8
Colorado:											
Colorado Springs	0	------	1	0	0	0	0	1	0	0	10
Denver	3	9	0	1	4	1	0	2	0	41	95
Pueblo	0	------	0	5	3	0	0	2	0	0	11
New Mexico:											
Albuquerque	0	------	0	0	0	0	0	1	0	2	11
Arizona:											
Phoenix	0	16	------	2	------	0	0	------	0	6	------
Utah:											
Salt Lake City	0	------	0	1	4	2	0	0	1	9	40
Washington:											
Seattle	0	------	0	2	2	3	0	5	0	17	87
Spokane	0	------	0	0	4	2	0	0	0	1	30
Tacoma	0	------	0	0	1	3	0	0	0	3	28
Oregon:											
Portland	0	------	0	0	2	3	0	2	0	2	79
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	4	5	0	4	4	16	0	10	1	21	331
Sacramento	3	------	0	1	4	0	0	0	0	2	32
San Francisco	0	------	1	2	5	4	0	9	1	13	153

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	0	0	6
Springfield	0	0	1
Rhode Island:			
Providence	0	0	1
Connecticut:			
Hartford	0	0	2
New York:			
Buffalo	0	0	2
New York	1	0	42
Rochester	0	0	9
Syracuse	0	0	3
New Jersey:			
Camden	0	0	4
Pennsylvania:			
Philadelphia	0	0	12
Pittsburgh	1	0	5
Reading	0	0	3
Scranton	0	0	1
Ohio:			
Cleveland	0	0	13
Toledo	0	0	2
Illinois:			
Chicago	0	0	17
Elgin	0	0	1
Michigan:			
Detroit	0	0	9
Grand Rapids	0	0	1
Minnesota:			
Minneapolis	0	0	4
St. Paul	0	0	6
Missouri:			
Kansas City	0	0	1
Delaware:			
Wilmington	0	0	1
Maryland:			
Baltimore	0	0	2
District of Columbia:			
Washington	0	0	3
Virginia:			
Roanoke	0	0	1
South Carolina:			
Greenville	0	0	1
Georgia:			
Atlanta	1	0	0
Savannah	0	0	1
Kentucky:			
Louisville	0	0	1
Tennessee:			
Knoxville	0	0	1
Nashville	0	0	5
Alabama:			
Birmingham	0	0	6
Louisiana:			
Shreveport	1	1	0
Texas:			
Fort Worth	0	0	2
Colorado:			
Denver	1	1	0
Pueblo	0	0	1
Utah:			
Salt Lake City	0	0	3
California:			
Los Angeles	0	0	2

Encephalitis, epidemic or lethargic.—Cases: Minneapolis, 3; St. Paul, 1; Washington, 1; Mobile, 1. Deaths: New York, 3; Minneapolis, 1.

Pellagra.—Cases: Wilmington, N. C., 1; Savannah, 4; Phoenix, 1.

Typhus fever.—Cases: Norfolk, 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 4; Miami, 1; Birmingham, 1; New Orleans, 1; Fort Worth, 1; San Antonio, 1; Los Angeles, 1. Deaths: Birmingham, 1; Shreveport, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,371,869)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Sept. 27, 1941	9 69	7 03	0 47	16 09	41 87	48 44	0 00	45 00	6 87	189 84
Average for week, 1936–40	15 17	7 58	2 37	29 23	48 66	60 50	32	49 45	9 16	157 03

PLAGUE INFECTION IN GROUND SQUIRRELS AND IN FLEAS FROM GROUND SQUIRRELS IN SISKIYOU COUNTY, CALIF.

Under date of September 29, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in 3 pools of fleas from ground squirrels, *C. douglasii*, found in Siskiyou County, Calif., as follows: One a pool of 113 fleas from 5 ground squirrels, another of 22 fleas from 1 ground squirrel, and a third of 165 fleas from 6 ground squirrels. Two of these specimens were submitted to the laboratory on August 21 and 22, from locations, respectively, about ½ mile north and 1½ miles northwest of Mount Shasta City, and the third, submitted to the laboratory on August 29, was from a ranch 4 miles south and 2 miles west of Weed.

Under date of September 30, Dr. Brown also reported plague infection proved in organs from one ground squirrel, *C. douglasii*, submitted to the laboratory on July 11 from a ranch 8 miles east and 3 miles south of Montague, Siskiyou County.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 6, 1941.—During the week ended September 6, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1		7	5			1		14
Chickenpox			2	9	31	12	1	11	15	81
Diphtheria		4		23	4	3	4			38
Dysentery				15	2					17
Influenza	1	4			2	2				9
Lethargic encephalitis					2	31	[1] 101	12		146
Measles				105	22	5	1	6	20	159
Mumps				10	29	15	4		26	84
Pneumonia					2				6	8
Poliomyelitis			37	3	7	52	1	24	3	127
Scarlet fever		8	2	54	53	3	4	6	5	130
Tuberculosis		3	4	77	40	55	37	1		217
Typhoid and paratyphoid fever				39	1	1	7	3	5	56
Whooping cough			2	88	124	3	1		19	237

[1] Encephalomyelitis.

COSTA RICA

Communicable diseases—August 1941.—During the month of August 1941, certain communicable diseases were reported in Costa Rica as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	38	1	Poliomyelitis	4	
Influenza	200	1	Scarlet fever	25	
Measles	46		Typhoid and paratyphoid fever	8	

FINLAND

Communicable diseases—July 1941.—During the month of July 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	107	Poliomyelitis	6
Dysentery	4	Scarlet fever	165
Influenza	298	Typhoid fever	48
Paratyphoid fever	94		

SWEDEN

Communicable diseases—July 1941.—During the month of July 1941, cases of certain communicable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	5	Scarlet fever	676
Diphtheria	8	Syphilis	19
Dysentery	14	Typhoid fever	1
Gonorrhea	1,117	Undulant fever	7
Paratyphoid fever	73	Weil's disease	6
Poliomyelitis	17		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Ceylon—Trincomalie.—During the week ended August 23, 1941, 1 case of cholera was reported in Trincomalie, Ceylon.

* * *

COURT DECISION ON PUBLIC HEALTH

Creation of sanitary districts.—(North Carolina Supreme Court; *Idol et al.* v. *Hanes et al.*, 14 S.E.2d 801; decided May 31, 1941.) A statute of North Carolina relating to the creation of sanitary districts provided that 51 percent or more of the resident freeholders within a proposed district could petition the board of county commissioners of the appropriate county, setting forth the boundaries of the proposed district and the objects to be accomplished. Such board, if it approved the petition, was required to transmit the same to the State board of health, but before passing upon the petition the board of county commissioners had to hold a public hearing. Prior notice of such hearing was required to be given in the manner prescribed by the statute.

A petition containing the signatures of the required 51 percent of the resident freeholders was filed with a board of county commissioners and notice of a hearing by the board was given. However, before the hearing was had and before any action toward approval was taken by the commissioners, a number of signers of the petition signified their desire to withdraw their names from the petition. The board of county commissioners at a hearing proceeded to approve the petition notwithstanding the requested withdrawals and prepared to forward such approval to the State board of health. However, a

suit was brought to enjoin the commissioners from any further action in the proceeding, and on appeal to the State supreme court it was stipulated that, if the persons who requested the withdrawal of their names had the right to withdraw and could not be counted as signers by the board of county commissioners at its meeting, then the petition did not contain the signatures of 51 percent of the resident freeholders of the proposed sanitary district.

The appellate court took the view that an individual petitioner could, as of right, withdraw his name from the petition at any time before final action by the board of county commissioners on the question of approval, and that the withdrawal of the petitioners, conceded in the stipulation to reduce the number to less than 51 percent of the resident freeholders, was fatal to the jurisdiction of the defendant board of county commissioners and abated its authority to act in the premises.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 **OCTOBER 24, 1941** NUMBER 43

IN THIS ISSUE

Health and Other Problems in the Army Maneuvers

Health Status of Adults in the Productive Ages

Description of New Method for Viewing Kodachrome

CONTENTS

Public Health Reports

Vol. 56 • OCTOBER 24, 1941 • *No. 43*

PLANS FOR HANDLING SPECIAL HEALTH AND OTHER PROBLEMS INCIDENT TO THE ARMY MANEUVERS IN TENNESSEE

By W. C. WILLIAMS, *Commissioner of Public Health*, and G. F. McGINNES, *Director Venereal Disease Control Service, Tennessee Department of Public Health*

During the month of June 1941, the Second Army held field maneuvers in south central Tennessee, with headquarters in Manchester, Coffee County, approximately midway between Nashville and Chattanooga. The headquarters company and the quartermaster, ordnance, engineers, and other supply and maintenance troops came into the area first, arriving on May 10, 11, and 12, and remained until July 10. The combat troops followed, arriving on May 28, 29, and 30, and left between June 30 and July 3. During the month of June approximately 77,000 officers and men were stationed in the area.

In preparation for the Army maneuvers in Tennessee a conference was held in Atlanta, Ga., on April 14, 1941. Those present at this conference were Dr. L. L. Williams, Jr., of the United States Public Health Service, liaison officer for the Fourth Corps Area; Dr. W. K. Sharp, Jr., Regional Director of District No. 2, United States Public Health Service; Col. P. W. Gibson, Surgeon of the Second Army; Dr. W. C. Williams, Commissioner of Public Health of Tennessee; and Assistant Surgeon General J. W. Mountin of the United States Public Health Service. After Colonel Gibson had outlined plans for the maneuvers, there was a general discussion of the method of handling the special health and other problems involved. It was decided that the Commissioner of Public Health should request the Governor of Tennessee to call a meeting of representatives of the Second Army and the State Commissioners of Health, Safety, Highway, Conservation, and Agriculture for the purpose of discussing a coordinated

program. Under the laws of Tennessee each of the State officials mentioned has some responsibility in administering public health work or related activities.

This meeting, called by Governor Prentice Cooper on April 23, 1941, resulted in the creation of a Coordinating Unit. Dr. G. Foard McGinnes was appointed Coordinator to handle the problems of vice control (including prostitution and venereal disease control), sanitation of food and food-handling establishments, milk sanitation, and general communicable disease control. All personnel assigned to this unit, regardless of the agency by which they were employed, were directly responsible to the Coordinator. Through this unit liaison was established with the highway patrol and with military and civilian authorities.

Headquarters for the Coordinating Unit were established in the office of the Coffee County Health Department at Manchester, Tenn., on May 12, 1941. The office was kept open 24 hours a day with the personnel working in three shifts. In addition to regular telephone service this office had direct connections with the Army headquarters.

The personnel of the unit consisted of the Coordinator, 3 physicians, 3 field nurses, 1 headquarters nurse, 3 clerks, 1 sanitary engineer, 2 sanitation officers, 10 deputy sheriffs, and 2 special State officers. The Department of Conservation detailed to the unit 1 chief hotel and restaurant inspector and 5 field inspectors, and the Department of Agriculture detailed 1 chief milk inspector and 6 milk sanitarians. The State Department of Safety detailed 1 division chief, 5 sergeants, and 30 patrolmen to the area. The United States Public Health Service furnished a trailer laboratory with a technician and assistant, which arrived on May 26, 1941.

The Coordinator met with the local authorities in each of the 10 counties in and surrounding the maneuver area to explain the control program and request their cooperation and support. A meeting was also held with the mayors, health officers, and chiefs of police of the cities of Nashville, Chattanooga, and Knoxville, for the purpose of requesting their cooperation in vice control in the respective cities for the protection of soldiers on week-end leave. The programs for the handling of special problems are given in the following sections.

FOOD AND EATING ESTABLISHMENTS

Personnel of the Department of Conservation, in cooperation with local health authorities, inspected all food and eating establishments in the area prior to the beginning of maneuvers. Those establishments which were allowed to remain open were required to comply

with State and local laws. During the month preceding the maneuvers inspections were made and action taken as follows:

Places inspected and graded	199
Places reinspected and regraded	4
Places reinspected and progress made	94
Places reinspected, all orders complied with	101
Permits revoked or surrendered	11
Court action (warrants)	19

The inspectors also closed or prevented the opening of 23 eating establishments of a temporary type and checked on 184 places (groceries) which did not come directly under their supervision in connection with the serving of food and general sanitation.

During the month when the maneuvers were in progress the following inspections were made and results obtained:

Total calls	3,263
Places regraded and grade raised	14
Places regraded and grade not raised	10
Permits revoked or surrendered (5 of these met requirements and reopened)	13
Court action (warrants)	17
Convicted and fined (balance pending)	12
Temporary operations stopped	49

MILK AND OTHER DAIRY PRODUCTS

The personnel of the Department of Conservation, in cooperation with the local authorities, inspected all milk plants, ice cream plants, and establishments of raw milk distributors and producer-distributors supplying milk to pasteurization plants and ice cream plants. A list of all such plants with their grades was furnished to the Chief Surgeon of the Second Army.

All grocery stores, meat markets, soda fountains, and stores dispensing ice cream were also inspected. Only those complying with State and local sanitary laws were allowed to remain open. These establishments were frequently reinspected during the period of the maneuvers.

UNITED STATES PUBLIC HEALTH SERVICE TRAILER LABORATORY

On May 24, 1941, one of the trailer laboratories of the United States Public Health Service was sent to Tennessee from Cincinnati, Ohio, to assist in sanitation activities in the Second Army maneuver area. Manchester was selected as the site of the trailer laboratory because of its central location. The work of the laboratory was confined to bacteriological examinations of milk, ice cream, streams, wet ice boxes, ice cream scoop dishes, and public, semipublic, and private water supplies.

The following is a summary of the analyses made during the month of June 1941:

	Samples examined	Tests performed
Milk samples	259	259
Milk bottles examined to test bottle washing efficiency	4	4
Milk samples examined for coliform bacilli	15	15
Total milk samples	278	278
Water samples from public water supplies	90	180
Water samples for public water treatment plants	63	126
Dairy and semipublic water supply samples	28	56
Stream samples	21	23
Water samples from restaurant wet coolers	11	22
Water samples from ice cream scoop dishes	6	6
Total water samples	219	413

In order to study actual conditions and to effect improvements before troops move into an area, a laboratory unit should be on the ground at least a month prior to the maneuvers.

GENERAL SANITATION

The sanitation problems were handled by a sanitary engineer and two sanitation officers of the Coffee County Health Department. The sanitary engineer had general charge of all sanitation, including food and eating establishments, milk, and dairy products. The sanitation officers devoted their full time to emergency sanitation problems, mosquito control, and other reported nuisances.

SAFETY

Just before the field maneuvers began the Director of the Department of Safety, Maj. T. E. Morris, and the Coordinator met with the Adjutant General and the Provost Marshal of the Second Army to work out plans for handling military and civilian traffic. A speed limit of 35 miles per hour was put into effect in the entire maneuver area. When there were movements of large numbers of troops on certain highways, the speed limit was reduced to 15 miles per hour by placing a patrolman at both ends of the highway. At no time, however, were any of the highways closed to the public. The public cooperated very well with the State patrol in carrying out safety measures, as indicated by the fact that only about 30 arrests were made during the entire month and no serious or fatal accident occurred on the highways during the maneuver period.

Since the movements of the various combat divisions were more or less secret, it was found advisable to detail a sergeant and several patrolmen to the Provost Marshal of the Second Army and to each combat division. In this way the sergeant and patrolmen detailed to

each unit carried out safety measures required for the protection of the public on highways during certain secret movements of the troops. They also kept the division chief notified of the highways over which most military traffic would pass, in order that civilian traffic entering these areas could be cautioned to proceed slowly.

In addition to the handling of civilian and military traffic on the highways, the State patrolmen aided in picking up female vagrants on the highways as well as preventing trailers from remaining in the maneuver area. They also reported to the Coordinator any itinerant roadside eating establishments which came to their attention.

THE CONTROL OF PROSTITUTION AND VENEREAL DISEASES

Clinics for the diagnosis and treatment of venereal diseases were operated in the offices of the health departments at Manchester, Tullahoma, Murfreesboro, Winchester, Pelham, and Fayetteville. Special clinics were established in Shelbyville, McMinnville, Woodbury, Lynchburg, and Jasper where there were no full-time health departments. Physicians and nurses especially employed for this program operated these special clinics and aided the local health officers in operating the clinics of the full-time health departments. Laboratory specimens were sent to the central laboratory each evening by messenger and the reports for the previous day were returned by the same messenger.

The control of vice and prostitution.—From May 12 to June 30, 1941, a deputy sheriff was employed on a full-time basis in each of the 10 counties in and surrounding the maneuver area for the purpose of apprehending prostitutes and arresting female vagrants. Two special officers with State and local police authority were employed full-time to supervise and direct the activities of the deputy sheriffs. The deputy sheriffs were required to report daily to the special officers, who in turn reported daily to the Coordinator.

All persons suspected of immoral acts and all female vagrants were arrested and confined in the local jails until examined by a physician from the health department. Those found infected with venereal disease were quarantined and treated for the duration of the maneuvers. Those suspected of being prostitutes and who were found negative on the first examination were held in most instances for a second examination a week later. If found negative on the second examination they were released and sent out of the maneuver area. Those arrested on vagrancy charges who were found negative were fined and if able to pay the fine were escorted out of the area; otherwise they were retained in the workhouse until they had worked out their fines. All known houses of prostitution were closed and the inmates arrested. Tourist camps and "juke joints" (or honky-tonks) were under constant surveillance.

The Second Army and the State highway patrol cooperated in keeping trailers from stopping overnight in the maneuver area. Each officer in the area was on the alert for trailers, and a prize was offered to anyone finding a trailer at night. It is believed that no trailer actually stopped in the area.

During May, 125 prostitutes and vagrants were examined and 93, or 74.4 percent, were found to have either syphilis or gonorrhea or both. Only 63 were examined during June. This drop in the number of prostitutes and vagrants picked up was due to the work done in May and to the publicity given the methods of prostitution control which discouraged such persons from coming to the area during the maneuver period. The results of the examinations are given in table 1.

TABLE 1.—*Results of examination of prostitutes and vagrants arrested in May and June in maneuver area*

	Total		May		June	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Total examined	188	100	125	100	63	100
Syphilis	58	30 9	45	36 0	13	20 6
Gonorrhea	86	45 7	63	50 4	23	36 5
Syphilis and gonorrhea	22	11 7	15	12 0	7	11 1
Total infected	122	64 9	93	74 4	29	46 0

During the 2 months 188 prostitutes and vagrants were examined. Of these, 58 (30.9 percent) were found to have syphilis and 86 (45.7 percent) gonorrhea. In all, 122 (64.9 percent) were found infected with at least one of the venereal diseases.

Cases of venereal disease among troops.—During the maneuver period 10 cases of syphilis and 82 cases of gonorrhea were found among troops of the Second Army. Contact histories were obtained and only 2 of the cases of syphilis and 12 of the cases of gonorrhea were traced to sources in the maneuver area. Three cases of syphilis and 32 cases of gonorrhea were believed to have been contracted in Tennessee outside of the maneuver area, while the sources of infection of nearly half the cases (5 of syphilis and 38 of gonorrhea) were thought to have been in areas outside the State. The areas of contact of the reported cases of syphilis and gonorrhea are given in table 2.

TABLE 2.—*Reported cases of syphilis and gonorrhea among troops of Second Army according to area of contact, by color*

	Total		White		Colored	
	Syphilis	Gonorrhea	Syphilis	Gonorrhea	Syphilis	Gonorrhea
Total	10	82	7	69	3	13
In State maneuver area	2	12	1	8	1	4
Outside of maneuver area	3	32	2	31	1	1
Out of State	5	38	4	30	1	8

In order to obtain attack rates, the numbers of days in the area have been estimated for the white and colored troops. Annual attack rates per 1,000 have been calculated and are shown in table 3.

TABLE 3.—*Reported cases of syphilis and gonorrhea among troops of Second Army, with attack rates per 1,000, by color*

	Troops (estimated)	Days in area (estimated)	Average number of days in area (estimated)	Syphilis		Gonorrhea	
				Cases	Annual rate	Cases	Annual rate
Total	77,000	2,537,500	33.0	10	1.4	82	11.8
White	76,250	2,492,500	32.7	7	1.0	69	10.1
Colored	750	45,000	60.0	3	24.3	13	105.4

On an annual basis the attack rate for syphilis was found to be 1.4 per 1,000, while the rate for gonorrhea was considerably higher, 11.8 per 1,000. The attack rate for the colored troops was higher than for the white troops.

In view of the data given in tables 2 and 3, it is believed that the program instituted and carried out in the maneuver area was reasonably effective in the control of venereal diseases.

HEALTH STATUS OF ADULTS IN THE PRODUCTIVE AGES[1]

By DAVID E. HAILMAN, *Associate Statistician, United States Public Health Service*

When a test of strength seems imminent, individuals or nations hasten to appraise their assets and liabilities. The people of the United States are now preparing for such a test and are therefore taking inventories of their military, financial, industrial, and political powers. But most of all, perhaps, they are concerned with their manpower—not only in terms of numbers but also in terms of physical and mental health.

YOUNG MEN

Of first concern at this time is the health of the young men of this country. The rapid expansion of the armed forces, through voluntary enlistment and compulsory training, will call into service mainly young men between the ages of 20 and 35. An even more rapid expansion of industry will undoubtedly draw heavily upon the reservoir of unemployed men in these age groups.

[1] From the Environmental Sanitation Section of the Division of Public Health Methods, National Institute of Health. Acknowledgment is made to Rollo H. Britten, senior statistician, and James S. Fitzgerald for assistance in the preparation of this report, and to Margaret T. Comstock for much of the statistical tabulation. Assistance in the preparation of the National Health Survey data was furnished by the personnel of Work Projects Administration Official Projects Nos. 712159-658/0999 and 765-23-3-10.

415457°—41——2

There are two sources, among others, from which valuable data on the health of young men can be obtained: The National Health Survey conducted in 1935–36, and Love and Davenport's study of defects among men drafted during the World War (1917–18).

For adults, health is determined largely by the presence or absence of chronic disease and by the nature and severity of the disease when present; however, acute disabling illness, not associated with chronic disease, is also a factor. The National Health Survey gathered, among other information, data on handicapping chronic diseases and physical impairments whether or not they had caused disability, and on serious disabling illnesses from acute diseases.[2] In table 1 is given the percentage of adults aged 20 to 65 who fall into 7 groups according to health status, ranging from group a, those who were permanently incapacitated from major chronic disease, to group g, those who had no handicapping chronic disease or serious disabling illness.

If these percentages (for the urban population) are applied to the estimated 16,234,230 young men in 1940 between the ages of 20 and 35 (both urban and rural)[3] the following numbers would fall into the 7 groups, listed as in table 1.

Group	*Number of men, aged 20–34*
a. Major chronic disease—disability of 12 months or longer	76, 000
b. Major chronic disease—disability of 3 weeks to 12 months	260, 000
c. Major chronic disease—disability of less than 3 weeks or no disability	910, 000
d. Minor chronic disease—with or without disability	760, 000
e. No chronic disease—acute illness with disability of 3 weeks to 3 months	320, 000
f. No chronic disease—acute illness with disability of 1 to 3 weeks	420, 000
g. No chronic disease—no acute illness with disability of 1 week or longer	13, 500, 000

It appears from the foregoing estimates that there were in the United States in 1940 about 76,000 men aged 20–34 who are probably permanently incapacitated (group a); 260,000 have major chronic diseases or impairments such as heart disease, high blood pressure, nephritis, rheumatism, or orthopedic impairments, and also have been disabled for such long periods of time during the past year that they have been prevented from or seriously hindered in working, seeking

[2] The National Health Survey was a house-to-house canvass of about 700,000 families in 83 cities in 18 States, representative generally of the urban population as a whole. About 37,000 families in rural areas were also canvassed, but these were not considered to be sufficiently representative of the rural population of the United States to be included in this article. The survey followed established techniques, information being obtained by trained enumerators from the housewife or other responsible member of the household.

For a more detailed discussion of the scope, method, and general definitions, see Perrott, George St. J., Tibbitts, Clark, and Britten, Rollo H.: The National Health Survey: Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting. Pub. Health Rep., 54: 1663 (1939). Reprint 2098.

For general rates of illness according to several different measures see Britten, Rollo H., Collins, Selwyn D., and Fitzgerald, James S.: The National Health Survey: Some general findings as to disease, accidents, and impairments in urban areas Pub. Health Rep., 55: 444 (1940.) Reprint 2143.

[3] Based on release of U. S. Census Bureau, July 23, 1941 (Series P-3, No. 15).

work, or attending school (group b); another 910,000 men, while not disabled for such long periods of time, are more or less seriously handicapped because of these major chronic diseases and impairments (group c); still another 760,000 men have some noticeable degree of handicap caused by lesser chronic diseases such as hay fever, hernia, hemorrhoids, or sinusitis (group d). (See table 5 and its footnotes for explanation and a more complete list of major and minor chronic diseases.)

TABLE 1.—*Percentage distribution according to health status of men and women aged 20–64, classified in two age groups*

[National Health Survey 1935–36][1]

Health status of men and women who—	Age (years)			
	Men		Women	
	20–34	35–64	20–34	35–64
a. Have 1 or more major chronic diseases or serious impairments and have been disabled[2] for the entire past 12 months (living at home, not in institutions)	0.47	1.7	0.46	1.2
b. Have 1 or more major chronic diseases or serious impairments and have been disabled for 3 weeks (from illnesses lasting 1 week or more) but less than 12 months during the past year[3]	1.6	2.8	3.1	4.8
c. Have 1 or 2 major chronic diseases or serious impairments and have been disabled for less than 3 weeks during the past year, or have not been disabled	5.6	12.1	6.3	15.4
d. Have no major chronic disease or serious impairment but have 1 or 2 minor chronic diseases, with or without disability[4]	4.7	7.0	5.4	7.2
e. Have no chronic disease or serious impairment but have had one or more acute illnesses (from disease, accident, or confinement) which have disabled for 3 weeks to 3 months[2] (from illnesses lasting 1 week or more) during the past year	2.0	2.1	6.6	3.6
f. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease, accident, or confinement) which have disabled for 1 to 3 weeks (from illnesses lasting 1 week or more) during the past year	2.6	1.7	6.1	3.4
g. Have no chronic disease and no acute illness which has disabled for 1 week or more during the past year	83.0	72.6	72.0	64.4
Total	100.0	100.0	100.0	100.0

[1] Data based on a 0.5 percent random sample of 1,530,832 white and colored persons aged 20–64 years enumerated in the National Health Survey, distributed by age and sex as follows—Male: 20–34 years, 298,096; 35–64 years, 351,449. Female: 20–34 years, 430,344; 35–64 years, 450,943.

[2] "Chronic" refers to illnesses the disease symptoms of which had been noticed for at least 3 months before the day of the visit. All other illnesses are classified as "acute."

For a list of the most important major chronic diseases and impairments see table 5. The division into major and minor chronic disease is based largely upon the proportion of disabling cases among all recorded cases of a particular disease or disease group.

Disability is defined as inability to work, attend school, care for home, or carry on other usual pursuits by reason of disease, accident, or physical or mental impairment.

[3] This group, b, also includes persons with 3 or more chronic diseases, regardless of disability; and workers disabled less than 12 months, but reported as "unemployable," that is, prevented from working or seeking work by reason of severe chronic disease or incapacitating impairment.

[4] For a list of the most important minor chronic diseases see table 5.

Thus it seems that there is a minimum[4] of 2,000,000 young men (aged 20 to 34) who have a handicapping chronic disease or impairment (groups a, b, c, and d). There are an additional 740,000 young men, as a minimum, who do not, to their knowledge, have any handicapping chronic disease, but each of whom has had during the past

[4] Because of the known impossibility of complete enumeration of illness and chronic disease, this estimate and those to follow are to be considered as minimum. However, it is probable that there was more complete enumeration of illness and disease among women, since the housewife, who was usually the family informant, tended to report more fully for herself than for other members of the family.

year one or more illnesses lasting 7 days or longer caused by acute disease.

General physical examinations, not undertaken by the Health Survey, can be expected to reveal many more physical and mental impairments or defects, particularly those of a minor or incipient nature.[5] Many of these minor defects may be the precursors of actual chronic ailments but they have not as yet become recognized chronic diseases of a handicapping nature, such as reported in the Health Survey.

The results obtained from physical examinations for a special purpose can be expected to differ from those obtained from general examinations and from house-to-house canvasses, such as the National Health Survey. The physical examinations given by the draft boards during the World War had the very special purpose of selecting young men for service in the armed forces. However, a study by Love and Davenport[6] based upon the results of these special physical examinations gives valuable data, in general, as to the extent, nature, and severity of defects found among men in these ages, 21–30 years—data which are comparable in certain ways to the National Health Survey findings.

Approximately 10,000,000 men between the ages of 21 and 31 were registered for the draft. Not all of the men were given physical examinations; but of those who were,[7] the "second million" (967,486 men, a sample chosen from those sent to camp after May 1, 1918) represents the best group for the purpose of this study, since the examination procedure had been clarified and improved for these men. (In order to furnish a complete picture of the prevalence of defects among young men, it has been necessary to include with the sample "second million" a proportionate number of the 549,099 men rejected and the 299,456 men placed in a remediable and limited service group by the local boards and never sent to camp; each of these men, of course, had one or more defects.)

Among these drafted men ("second million" plus a proportion of local board rejected and limited service groups), it is estimated that 52.1 percent had one or more defects, distributed as follows: 20.9 percent were accepted for general military duty, 9.9 percent were ac-

[5] See Sydenstricker, Edgar, and Britten, Rollo H The physical impairments of adult life Am J Hyg, 11:73–135 (January 1930)

[6] Love, Albert B, and Davenport, Charles B Defects found in drafted men War Department, U S Government Printing Office, 1920

[7] The physical examinations were made by about 4,648 local boards with more than that number of examining physicians Many of the men were also examined by medical advisory boards, with a total number of 9,577 examining physicians In addition, they were examined by thousands of medical officers at the various Army cantonments, camps, and posts

cepted for limited service only, and 21.3 percent were rejected for any duty.[8]

In connection with defects among the rejected men, the authors state, "Many of the defects noted are obviously noteworthy only from a military standpoint * * * . A large proportion of the mechanical defects * * * are no serious handicap in civil life. Also, many of the defects of sense organs found are easily capable of correction so as to fit a man to perform his duties in civil life. Altogether, it is clear that fully half of the defects found are not of such a nature as to interfere seriously with the man performing services of the highest order in civil life." If 21 percent of the men ("second million" plus a proportion of local board rejected and limited service groups) were rejected and if half of those rejected had no defects which were seriously handicapping in civil employment, then another half, or almost 11 percent of the total, did have such handicapping defects. In this connection, data from the National Health Survey show that about 12 percent of men aged 20–34, living in urban communities, were reported to have chronic diseases or physical impairments of a handicapping nature (groups a, b, c, and d, table 1).

Employment status.—It has been suggested earlier in this paper that, if present trends continue, unemployed young men will rapidly find places in industry or in the armed forces. What is the health of unemployed young men when contrasted with that of the employed? Data from the National Health Survey give some basis of comparison (table 2).

The percentages falling into each health status group (a, b, c, etc.) are not widely different for the employed and for the unemployed. Furthermore, the high percentage (92) of unemployed young men falling into groups d, e, f, and g would indicate that the majority of unemployed young men can take their places in industry or in the armed forces alongside the employed, if given the opportunity.

One fact worth noting, however, is the higher proportion of unemployed than of employed men with disabling chronic diseases, especially those with the longer periods of disability (group b). This relatively high rate of disabling illness from chronic diseases among unemployed young men is borne out by other data from the National Health Survey.[9]

---

[8] For a more complete description of the statistical methods used in making the estimates, see Britten, Rollo H., and Perrott, George St. J.: Summary of physical findings on men drafted in the World War. Pub. Health Rep., 56: 41 (Jan. 10, 1941).

[9] Illness among employed and unemployed workers. Preliminary Reports, The National Health Survey, Sickness and Medical Care Series. Bull. No. 7 (1938).

Hailman, David E.: The prevalence of disabling illness among male and female workers and housewives. Pub. Health Bull. No. 260, U. S. Government Printing Office, 1941.

Figures in table 2 also indicate that young men in school (including those 15–19 years of age) have only a slightly better health status than workers, either employed or unemployed.

TABLE 2.—*Percentage distribution according to health status of men aged 20–34, classified by employment status*

[National Health Survey 1935–36][1]

Health status of men who—	Employed	Unemployed	In school[2]
a. Have 1 or more major chronic diseases or serious impairments and have been disabled for the entire past 12 months[3]			
b. Have 1 or more major chronic diseases or serious impairments and have been disabled for 3 weeks (from illnesses lasting 1 week or more) but less than 12 months during the past year[4]	1.1	2.6	1.0
c. Have 1 or 2 major chronic diseases or serious impairments and have been disabled for less than 3 weeks during the past year, or have not been disabled	5.4	5.4	3.5
d. Have no major chronic disease or serious impairment but have 1 or 2 minor chronic diseases, with or without disability[5]	5.0	3.5	4.0
e. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease or accident) which have disabled for 3 weeks to 3 months[4] (from illnesses lasting 1 week or more) during the past year	2.0	2.2	2.0
f. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease or accident) which have disabled for 1 to 3 weeks (from illnesses lasting 1 week or more) during the past year	2.7	2.6	4.3
g. Have no chronic disease and no acute illness which has disabled for 1 week or more during the past year	83.8	83.7	85.3
Total	100.0	100.0	100.0

[1] Data based on a 0.5 percent random sample of 298,096 white and colored males aged 20–34 years enumerated in the National Health Survey.
[2] Includes boys 15–19 years of age in order to get a sufficient sample.
[3] This group is not considered to be in the labor market and is therefore not included in this table.
[4] "Chronic" refers to illnesses the disease symptoms of which had been noticed for at least 3 months before the day of the visit. All other illnesses are classified as "acute."
For a list of the most important major chronic diseases and impairments see table 5. The division into major and minor chronic disease is based largely upon the proportion of disabling cases among all recorded cases of a particular disease or disease group.
Disability is defined as inability to work, attend school, care for home, or carry on other usual pursuits by reason of disease, accident, or physical or mental impairment.
[5] For a list of the most important minor chronic diseases see table 5.

MEN AGED 35–64

So far as the immediate future can be foreseen, it is improbable that men between 35 and 65 years of age will be called upon to serve in the armed forces of the United States, but the situation with regard to industrial employment is different, since the speeding-up of the industrial program may in the future mean that all able-bodied men up to 65 years of age will be needed. The health of these men is therefore of great importance to the national security.

If the percentages given in table 1 are applied to the estimated 22,581,585 men between the ages of 35 and 65 in 1940 (see footnote 3), the following numbers would be found in the 7 groups:

Group	Number of men, aged 35–64
a. Major chronic disease—disability of 12 months or longer	380, 000
b. Major chronic disease—disability of 3 weeks to 12 months	630, 000
c. Major chronic disease—disability of less than 3 weeks or no disability	2, 730, 000
d. Minor chronic disease—with or without disability	1, 580, 000
e. No chronic disease—acute illness with disability of 3 weeks to 3 months	470, 000
f. No chronic disease—acute illness with disability of 1 to 3 weeks	380, 000
g. No chronic disease—no acute illness with disability of 1 week or longer	16, 400, 000

Thus, it is estimated that in the United States in 1940 there were about 380,000 men aged 35–64 who are probably permanently incapacitated (group a); 630,000 who have major chronic diseases and have been disabled for such long periods of time during the past year that they have been prevented from or seriously hindered in working, seeking work, or pursuing other usual activities (group b); another 2,730,000 who, while not disabled for such long periods, are more or less seriously handicapped in pursuing their usual activities because of these major chronic diseases (group c); still another 1,580,000 who have some noticeable degree of impairment from less serious chronic diseases (group d); and an additional 850,000 men in these ages who do not, to their knowledge, have any chronic diseases, but each of whom had in the past year one or more illnesses of 7 days or longer duration caused by an acute disease or accident (groups e and f). Many more men with incipient or borderline chronic disease would be found in this age group if general physical examinations were to be given.

Employment status.—For young men it was found that health status, according to the measures used, is not widely different among the employed and the unemployed, except that a small proportion of the unemployed have a relatively high rate of disabling illness of long duration from major chronic diseases and impairments. Among men 35–64, however, there are greater differences between the employed and the unemployed with respect to health.

There is among the unemployed men in these ages a relatively high concentration of men with chronic diseases and impairments, both major and minor, with varying degrees of disability (groups b, c, and d). Indeed 30 percent of these unemployed men are handicapped by chronic disease or impairments of varying severity (table 3).

TABLE 3.—*Percentage distribution according to health status of men aged 35–64, classified by employment status*

[National Health Survey 1935–36] [1]

Health status of men who—	Employed	Unemployed
a. Have 1 or more major chronic diseases or serious impairments and have been disabled for the entire past 12 months [2]		
b. Have 1 or more major chronic diseases or serious impairments and have been disabled for 3 weeks (from illnesses lasting 1 week or more) but less than 12 months during the past year [3]	1.7	4.9
c. Have 1 or 2 major chronic diseases or serious impairments and have been disabled for less than 3 weeks during the past year, or have not been disabled	10.8	17.3
d. Have no major chronic disease or serious impairment but have 1 or 2 minor chronic diseases, with or without disability [4]	7.1	7.6
e. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease or accident) which have disabled for 3 weeks to 3 months [3] (from illnesses lasting 1 week or more) during the past year	2.1	2.2
f. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease or accident) which have disabled for 1 to 3 weeks (from illnesses lasting 1 week or more) during the past year	1.8	1.5
g. Have no chronic disease and no acute illness which has disabled for 1 week or more during the past year	76.5	66.6
Total	100.0	100.0

[1] Data based on a 0.5 percent random sample of 351,449 white and colored males aged 35–64 years enumerated in the National Health Survey.

[2] This group is not considered to be in the labor market and is therefore not included in this table.

[3] "Chronic" refers to illnesses the disease symptoms of which had been noticed for at least 3 months before the day of the visit. All other illnesses are classified as "acute."

For a list of the most important major chronic diseases and impairments see table 5. The division into major and minor chronic disease is based largely upon the proportion of disabling cases among all recorded cases of a particular disease or disease group.

Disability is defined as inability to work, attend school, care for home, or carry on other usual pursuits by reason of disease, accident, or physical or mental impairment.

[4] For a list of the most important minor chronic diseases see table 5.

WOMEN

During the World War, when man power was at a premium, there was a large movement of women from the home to the factory and office. In the present emergency it is probable that as industry expands many more women will seek jobs and will be needed for them. These will be mainly young women, but some older women undoubtedly will enter industry, especially in jobs for which they have already been trained. This speeding-up of military and industrial preparedness certainly will place added responsibilities and work upon the women who remain at home. It is important then to know the health of all women in the productive ages, whether they be workers, potential workers, or housewives.

If the proper percentages given in table 1 (for the urban population) are applied to the estimated (see footnote 3) 16,692,937 women between the ages of 20 and 35 and the 21,743,138 between the ages of 35 and 65 in 1940 (urban and rural), the following numbers would be found in the 7 groups:

Group	Number of women, aged 20–34	Number of women, aged 35–64
a. Major chronic disease—disability of 12 months or longer	77, 000	260, 000
b. Major chronic disease—disability of 3 weeks to 12 months	520, 000	1, 040, 000
c. Major chronic disease—disability of less than 3 weeks or no disability	1, 050, 000	3, 350, 000
d. Minor chronic disease—with or without disability	900, 000	1, 570, 000
e. No chronic disease—acute illness with disability of 3 weeks to 3 months	1, 100, 000	780, 000
f. No chronic disease—acute illness with disability of 1 to 3 weeks	1, 020, 000	740, 000
g. No chronic disease—no acute illness with disability of 1 week or longer	12, 000, 000	14, 000, 000

It appears from the foregoing estimates that there were in the United States in 1940 about 77,000 women in the younger ages and 260,000 women in the older ages who are permanently incapacitated (group a); 520,000 young women and 1,040,000 older women who have major chronic diseases (such as cardiovascular-renal diseases, rheumatism, nervous and mental diseases, or cancer and tumors) or impairments and have been disabled for such long periods of time during the past year that they have been prevented from or seriously hindered in working, seeking work, caring for the home, or pursuing other usual activities (group b); another 1,050,000 younger women and 3,350,000 older women who, while not disabled for such long periods of time during the past year, are more or less seriously handicapped because of these major chronic diseases and impairments (group c); and still another 900,000 younger women and 1,570,000 older women who have some noticeable degree of handicap from less serious chronic diseases such as hay fever, hemorrhoids, varicose veins, or diseases of the female genital organs (excluding cancer and tumors) (group d).

Thus, it is estimated that there were in the United States in 1940, as a minimum, 2,500,000 women between the ages of 20 and 35 and 6,200,000 between the ages of 35 and 65 who have one or more handicapping chronic diseases or impairments (groups a, b, c, and d). An additional 2,000,000 women in the younger age group and 1,500,000 in the older age group do not, to their knowledge, have any chronic disease, but each had in the past year one or more illnesses lasting 7 days or longer, caused by acute disease or accident (groups e and f).

Employment status.—As mentioned previously, it is probably true that during the next few months or years women who are now housewives or not gainfully employed will be called upon for new jobs in defense industries and to fill certain of the vacancies left by men called to military service. What is the health of housewives and unemployed women as compared with those who are now employed?

Table 4 shows that unemployed women and housewives in both age groups (20–34 and 35–64) have a less favorable status with regard to health than do employed women, chiefly because of higher rates of chronic disease (groups b, c, and d), but in some part caused by illness from acute disease (groups e and f). These high rates of acute disease among housewives and unemployed women as compared with the employed would be reduced considerably if confinements were excluded, but differences would remain.[10]

TABLE 4.—*Percentage distribution according to health status of women aged 20–64, classified in 2 age groups, by employment status*

[National Health Survey 1935–36] [1]

Health status of women who—	Age (years)						
	20–34				35–64		
	Employed	Unemployed	Housewives	In school [2]	Employed	Unemployed	Housewives
a. Have 1 or more major chronic diseases or serious impairments and have been disabled for entire past 12 months [3]	------	------	------	------	------	------	------
b. Have 1 or more major chronic diseases or serious impairments and have been disabled for 3 weeks (from illnesses lasting 1 week or more) but less than 12 months during the past year [4]	1.1	3.7	4.5	0.9	1.9	6.0	5.0
c. Have 1 or 2 major chronic diseases or serious impairments and have been disabled for less than 3 weeks during the past year, or have not been disabled	3.1	6.6	9.1	2.1	10.8	16.3	16.9
d. Have no major chronic disease or serious impairment but have 1 or 2 minor chronic diseases, with or without disability [5]	3.5	3.7	7.1	4.5	7.0	7.4	7.6
e. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease, accident, or confinement) which have disabled for 3 weeks to 3 months [4] (from illnesses lasting 1 week or more) during the past year	2.4	2.2	[6] 10.5	3.0	2.2	2.5	3.9
f. Have no chronic disease or serious impairment but have had 1 or more acute illnesses (from disease, accident, or confinement) which have disabled for 1 to 3 weeks (from illnesses lasting 1 week or more) during the past year	2.9	[6] 8.1	[6] 8.3	3.0	2.2	1.9	3.2
g. Have no chronic disease and no acute illness which has disabled for 1 week or more during the past year	87.0	75.7	60.5	86.6	75.9	65.9	63.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Data based on a 0.5 percent random sample of 430,344 white and colored females between the ages of 20–34 years and 450,943 between the ages of 35–64 years enumerated in the National Health Survey.

[2] Includes girls 15–19 years of age in order to get a sufficient sample.

[3] This group is not considered to be in the labor market or able to carry on usual housewife duties and is therefore not included in this table.

[4] "Chronic" refers to illnesses the disease symptoms of which had been noticed for at least 3 months before the day of the visit. All other illnesses are classified as "acute."

For a list of the most important major chronic diseases and impairments see table 5. The division into major and minor chronic disease is based largely upon the proportion of disabling cases among all recorded cases of a particular disease or disease group.

Disability is defined as inability to work, attend school, care for home, or carry on other usual pursuits by reason of disease, accident, or physical or mental impairment.

[5] For a list of the most important minor chronic diseases, see table 5.

[6] These rates include a large number of confinements.

[10] For confirmation of some of these comparisons, see article by David E. Hailman listed in footnote 9.

If women who are not gainfully employed now are to be considered for employment, it is important to know that, of the unemployed women 20–34 years of age, 14 percent had a handicapping chronic disease or impairment, and of the unemployed women aged 35–64, 30 percent were so handicapped (groups b, c, and d); of young housewives, 21 percent, and of housewives aged 35–64, 29 percent were so handicapped.

NATURE OF CHRONIC DISEASE

The previous sections have been concerned, in large part, with the presence or absence of chronic disease or impairment and with the nature and severity of the disease when present. This section will present further data on the nature of the diseases found or the diagnoses.

Table 5 shows the prevalence of specified chronic diseases and impairments among men and women in two age groups, 20–34 and 35–64 years.[11] (See also footnote 4.) Among young men, orthopedic impairments predominate, followed by rheumatism and allied diseases, hay fever, hernia, cardiovascular-renal diseases, and sinusitis; among older men rheumatism, orthopedic impairments, cardiovascular-renal diseases, and hernia show relatively high rates, followed by hemorrhoids, deafness, hay fever, and asthma.

Among young women there are relatively high rates of rheumatism and cardiovascular-renal diseases, followed by hay fever, goiter, diseases of the female genital organs, sinusitis, hemorrhoids, nervous and mental diseases, and varicose veins. Among older women are found relatively high rates of rheumatism and cardiovascular-renal diseases, followed by varicose veins, hemorrhoids, deafness, hay fever, nervous and mental diseases, goiter, and orthopedic impairments.

---

[11] The relative importance of certain of these diseases as a cause of death is indicated in the following table:

Percentage distribution of deaths among persons 20–64 years of age, according to cause, classified in 2 age groups

[United States Census, 1938]

Cause of death	All ages, 20–64	20–34	35–64
All causes	100.0	100.0	100.0
Cardiovascular-renal diseases	35.9	13.2	40.6
Cancer and other tumors	13.9	5.1	15.8
Accidents and violent deaths	12.4	25.0	9.8
Tuberculosis (all forms)	8.4	19.5	6.2
Pneumonia (all forms)	5.5	6.5	5.8
Other infectious diseases	3.8	5.7	3.4
Nervous and mental diseases	2.5	2.8	2.4
Diabetes mellitus	2.8	.7	2.6
Rheumatism and allied diseases	.2	.4	.2
All other diseases	15.0	21.1	13.8

TABLE 5.—*Prevalence (per 1,000 persons) of specified chronic diseases or impairments, disabling and nondisabling, among adults 20–64 years of age, classified by sex in 2 age groups*

[National Health Survey 1935 36] [1]

Disease or disease group [2]	Total	Male		Female	
		20 34 years	35 64 years	20-34 years	35 64 years
Major chronic diseases and impairments:					
Rheumatism and allied diseases	47.5	12.4	62.2	21.4	84.2
Cardiovascular-renal diseases	39.3	8.7	49.6	17.0	72.7
Orthopedic impairments	21.7	20.0	52.4	5.8	14.0
Deafness	10.6	4.0	18.7	3.6	15.2
Asthma	9.0	4.6	15.8	4.6	11.0
Nervous and mental diseases	9.0	3.7	9.1	7.1	14.3
Goiter and other thyroid diseases	8.1	1.3	2.6	10.9	14.2
Blindness, 1 or both eyes	5.1	3.0	11.3	1.1	5.5
Cancer and other tumors	4.7	.8	2.4	3.9	9.9
Gall bladder and liver diseases	4.4	.3	3.5	1.9	10.3
Diabetes mellitus	4.1	1.0	5.1	.8	8.6
Ulcer of stomach	2.8	2.2	6.5	.9	2.3
Tuberculosis (all forms)	1.9	1.5	3.1	2.0	1.2
Minor chronic diseases:					
Hay fever	14.3	11.6	16.4	13.8	15.0
Hernia	13.7	10.6	40.7	1.4	6.3
Varicose veins	13.2	2.0	9.8	6.6	20.6
Hemorrhoids	12.4	4.7	20.5	7.3	15.9
Bronchitis	8.9	3.4	13.1	5.5	12.3
Sinusitis	8.3	6.2	9.5	7.3	9.6
Diseases of female genital organs	4.9			9.7	7.5

[1] Data based on a 0.5 percent random sample of cases among 1,530,832 white and colored persons aged 20–64 years enumerated in the National Health Survey, distributed by age and sex as follows—Male: 20–34 years, 298,096; 35–64 years, 351,449. Female: 20–34 years, 430,344, 35–64 years, 450,943.

[2] The division into major and minor is based largely upon the proportion of disabling cases among all cases of a specified disease or disease group recorded in the National Health Survey. A particular case of a major chronic disease may be relatively mild and a particular case of a minor chronic disease may be relatively severe.

Rheumatism and allied diseases.—Rheumatism, arthritis, gout, neuralgia, neuritis, lumbago, acute rheumatic fever, stiff neck, and other muscular pains.

Cardiovascular-renal diseases.—Heart diseases (including diseases of coronary arteries), arteriosclerosis, hypertension, cerebral hemorrhage, nephritis and other kidney diseases, and current paralysis except paresis.

Orthopedic impairments.—Permanent orthopedic impairments, including the loss, crippling, deforming or paralyzing of any member or part of the body.

Nervous and mental diseases.—Neurasthenia, nervous breakdown, epilepsy, chorea, locomotor ataxia, paresis, insanity, and other diseases of the nervous system.

Cancer and other tumors.—All cancers and other malignant and nonmalignant tumors, regardless of site.

Gall bladder and liver diseases.—Diseases of the gall bladder, biliary passages, and liver.

Ulcer of the stomach and duodenum.

Tuberculosis.—All forms of tuberculosis—respiratory, nonrespiratory, disseminated, and suspected.

Varicose veins.—Varicose veins or ulcers, varicocele.

It must be recalled again that these are diseases reported as handicapping by the patient or by the informant for the family and are therefore, in general, of a rather serious nature.

For certain chronic diseases and defects there are unusual difficulties in obtaining complete and accurate information in a house-to-house canvass; among these are tuberculosis, nervous and mental diseases, the venereal diseases, dental defects, malnutrition, pellagra, malaria, and hookworm disease. All of these chronic diseases or defects are widely prevalent among young persons as well as among older persons.

About 75,000 persons die yearly of tuberculosis, of whom 50,000 are in the productive ages, 20–64. Among young persons 20–34, it is the leading disease cause of death (accidents ranking first of all causes). It is estimated that 500,000 persons of all ages are ill from

tuberculosis,[12] a prevalence rate of about 4 per 1,000 persons. The great majority of these persons are in the productive ages.

Undoubtedly the prevalence of nervous and mental diseases as reported in the Health Survey (table 5), while great, underestimates the true situation. Because of the difficulties encountered in enumerating such diseases in a house-to-house canvass and because information from other sources is scanty, estimates from any source must be tentative. If Health Survey data, however, are adjusted for underenumeration (and if persons confined to institutions for mental disease are included), a rough figure of 2,000,000 persons with serious nervous and mental diseases is reached—a rate of about 15 per 1,000 persons. The great majority of these are 20–64 years of age and a considerable proportion in the younger ages, 20–34.

The Health Survey did not attempt to enumerate the venereal diseases. The prevalence of gonorrhea in the United States, never known with any certainty, is even more an unknown quantity since the introduction of relatively fast and efficacious chemotherapy. While the outlook for the eventual control of gonorrhea is bright, the prevalence of the disease is still exceedingly high, especially among young men.

There have been various estimates of the prevalence of syphilis in the United States, the most authoritative made in 1938 by the Venereal Disease Division of the United States Public Health Service.[13] Among persons 20–64 years of age, 10.8 per 1,000 have syphilis, that is, in the language of the authors cited, remain a "potential treatment problem." Among young persons 20–34, the prevalence rate is 8 per 1,000, and among older persons 35–64 it is 12.9 per 1,000.

Observations on the dental needs of adults in these ages are relatively few in number. Studies made by Henry Klein, dental officer in the United States Public Health Service, make available the following findings:

1. A group of youths aged 16–24 years working for the National Youth Administration or the Works Progress Administration shows a current need for fillings of about 9 permanent tooth surfaces per youth; a group of youths aged 20–24 years in the Navy shows 3 surfaces needing filling.

2. The yearly increment of carious permanent tooth surfaces was found to be 1.3 surfaces decayed per year per NYA–WPA boy, aged 16–24 years, and 1.2 surfaces per Navy youth, aged 20–24 years.

3. From these findings it is clear that the current accumulated need for fillings is perhaps almost as closely controlled by the amount,

---

[12] Whitney, Jessamine S.: High points of attack on tuberculosis. Trans. of the Thirteenth Annual Meeting of the National Tuberculosis Assoc., 1934, p. 151.

[13] Vonderlehr, R. A., and Usilton, Lida J. The chance of acquiring syphilis and the frequency of its disastrous outcome. Ven. Dis. Inf., 19: 396 (November 1938). Reprint 99.

kind, and rate of supply of dental care (fillings) as by the tendency to experience caries.

Hookworm is a disease indigenous primarily to rural coastal plain areas of the Southern States. Recent surveys (1930–38) "show that a substantial reduction has occurred in the incidence of hookworm in each of the (eight) Southern States in the counties studied" since previous surveys (1910–14).[14] However, these States still show high average percentages of persons with hookworm infestation (7.9 to 15.9 percent); one-fourth of these persons had infestations sufficiently severe to produce clinical symptoms. The age group 20–24 years showed higher than average (all ages) infestation, and above 25 years, decreasingly lower average infestation.

The prevalence of pellagra and malaria among adults is not known with any exactitude. That they are still widely prevalent, especially in rural districts in the South, is certain; on the other hand, public health, sanitary, and educational measures, along with a rising cultural level, are reducing their incidence.

SUMMARY

The health of men and women in the productive ages, 20–64, may be measured with data based on the National Health Survey (1935–36) and for men aged 20–34, upon Love and Davenport's study of defects among men drafted for the World War (1917–18).

(1) Health Survey data indicate that there were in the United States in 1940, as a minimum, 16,200,000 men and women in the productive ages, 20–64 (living at home, not in institutions) who have one or more handicapping chronic diseases or serious physical or mental impairments, the symptoms of which have been noticed for 3 months or more. To be added to this figure are an estimated 500,000 persons in these ages in institutions for the care of mental diseases and tuberculosis.[15] Moreover, for certain of these handicapping chronic diseases, there are obvious difficulties in obtaining complete information in a house-to-house canvass such as the Health Survey; notable among these are tuberculosis, nervous and mental diseases, the venereal diseases, pellagra, malaria, and hookworm disease. If all persons 20–64 years with these diseases could be included in the number with handicapping chronic diseases, the total would no doubt be considerably increased.

There are, as a minimum, an additional 5,200,000 adults in these ages who do not, to their knowledge, have any chronic disease but who had one or more acute illnesses disabling from 1 week to 3 months

[14] Keller, Alvin E., Leathers, U. S., and Densen, Paul M.: The results of recent studies of hookworm in eight Southern States Am J. Trop Med., 20: 493 (July 1940).

[15] Based upon data reported in Tuberculosis facilities in the United States J. Am. Med Assoc., 114 771 and 1162 (1940)

during the past year. Thus, upwards of 22,000,000 persons in the United States between the ages of 20 and 65 have one or more handicapping chronic diseases or physical impairments, or have had during the past year one or more serious acute illnesses. The remainder of persons in these ages, estimated to be from 50,000,000 to 55,000,000 persons, presumably have better health. They may, however, have lesser impairments not included above, such as defects of vision, enlarged tonsils, or defective or deficient teeth. They may also have incipient chronic diseases which can be revealed only by general physical examinations, or they may have had, during the past year, acute illnesses lasting less than 7 days.

(2) From Health Survey data it is estimated that there were in the United States in 1940, as a minimum, about 800,000 men and women between the ages of 20 and 65 who are more or less permanently incapacitated (excluding those persons living in institutions). They are distributed by age and sex as follows:

Age (years)	*Men*	*Women*
20–34	76, 000	77, 000
35–64	380, 000	260, 000

Almost as incapacitated a group of persons are those who have major chronic diseases and have been disabled for such long periods (3 weeks to 1 year) during the past year that they have been prevented from or seriously hindered in working, seeking work, attending school, caring for the home, or pursuing other usual activities. Included among the major chronic diseases and impairments are cardiovascular-renal diseases, nervous and mental diseases, rheumatism and allied diseases, tuberculosis, orthopedic impairments, blindness, deafness, diabetes, cancer and other tumors, asthma, gall bladder and liver diseases, goiter and other thyroid diseases, and ulcer of the stomach. There are in the United States a minimum of about 2,500,000 of these handicapped persons, distributed by age and sex as follows:

Age (years)	*Men*	*Women*
20–34	260, 000	520, 000
35–64	630, 000	1, 040, 000

Another 8,000,000 adults, while not disabled for such long periods of time, are more or less seriously handicapped owing to the presence of these major chronic diseases and impairments. They are distributed by age and sex as follows:

Age (years)	*Men*	*Women*
20–34	910, 000	1, 050, 000
35–64	2, 730, 000	3, 350, 000

Almost 5,000,000 adults 20–64 years of age have some noticeable degree of handicap from hay fever, sinusitis, varicose veins, hernia, hemorrhoids, diseases of the female genital organs, and other less

disabling, but nonetheless handicapping, chronic diseases. They are distributed by age and sex as follows:

Age (years)	Men	Women
20 34	760,000	900,000
35–64	1,580,000	1,570,000

Among adults who have no recognized handicapping chronic diseases or impairments, a minimum of 2,700,000 have had during the past year one or more acute illnesses (from disease or accident) which disabled for a period of from 3 weeks to 3 months. They are distributed by age and sex as follows:

Age (years)	Men	Women
20–34	320,000	1,100,000
35 64	470,000	780,000

Still another 2,600,000 persons who have no recognized handicapping chronic diseases or impairments have had during the previous year one or more acute illnesses (from disease or accident) which disabled them for 1 to 3 weeks at a time. They are distributed by age and sex as follows:

Age (years)	Men	Women
20–34	420,000	1,020,000
35–64	380,000	740,000

(3) Health Survey data lead to the conclusion that the health of the great majority of unemployed young men (aged 20–34) is not far different from that of the employed or that of young men in school. However, a higher proportion of unemployed than employed young men have major chronic diseases and impairments associated with long periods of disability.

For men 35–64 years of age there is a much greater concentration of all chronic diseases and impairments (major and minor, all periods of disability) among the unemployed than among the employed. Thirty percent of men in these ages have a chronic disease.

Unemployed women and housewives in either age group have a less favorable health status than do employed women, chiefly because of higher rates of chronic disease, but in some part caused by illness from acute disease.

(4) The chronic diseases and impairments most prevalent among adults 20–64 years, in descending order of frequency, are:

Men 20–34	*Women 20–34*
Orthopedic impairments	Rheumatism and allied diseases
Rheumatism and allied diseases	Cardiovascular-renal diseases
Hay fever	Hay fever
Hernia	Goiter and other thyroid diseases
Cardiovascular-renal diseases	Diseases of the female genital organs
Sinusitis	Sinusitis
Hemorrhoids	Hemorrhoids
Asthma	Nervous and mental diseases
Deafness	Varicose veins

Men 35–64	*Women 35–64*
Rheumatism and allied diseases	Rheumatism and allied diseases
Orthopedic impairments	Cardiovascular-renal diseases
Cardiovascular-renal diseases	Varicose veins
Hernia	Hemorrhoids
Hemorrhoids	Deafness
Deafness	Hay fever
Hay fever	Nervous and mental diseases
Asthma	Goiter and other thyroid diseases
Bronchitis	Orthopedic impairments

A NEW METHOD FOR VIEWING SHEET KODACHROME [1]

By ALBERT A. STONE, R. DONALD REED, and LOUIS SCHWARTZ, *Medical Director, United States Public Health Service*

In the photographic unit of the National Institute of Health, hundreds of transparencies of Kodachrome professional film have been produced during the past two years. Many of these were connected with studies on dermatoses, and therefore were required to show very fine detail. These films have been mounted for lantern slide projection and light box viewing. From selected ones, wash-off relief color prints were made for permanent exhibits. Often the fine detail on the film was lost in the wash-off prints.

Since printing of Kodachrome in color is expensive and time-consuming, often entailing inexactness in color and loss of detail, it was believed that if a technique could be developed for directly mounting Kodachrome film for exhibit purposes, a worth-while economy of time and money could be effected.

Some time ago a series of Kodachrome films was exposed under varying lighting conditions, and in the study of these test films it was observed that one of the transparencies, when placed on a white sheet, made a viewable picture. While this picture was sufficiently clear to show the pathological detail, it was believed that improvement in color values could be achieved with further experiments in exposure, chemical manipulation, and modifications in the material forming the reflective background.

We have now devised a method by which Kodachrome film can be mounted into a viewable picture. This is accomplished by means of accurately controlled lighting and exposure conditions, and backing material of high light-reflective properties. A technique has been developed whereby the density of the Kodachrome film can be reduced to the density necessary for our method of viewing.

[1] From the National Institute of Health.

DESCRIPTION OF METHOD

A fixed focus range finder is used as a means of maintaining a constant subject-camera distance.

Illumination is obtained by a total of 4,000 watts of incandescent light so placed that the subject is evenly illuminated. From data previously obtained with the lens to be used, the optimum exposure for a "thin" transparency is made. In case of doubt, slight underexposure for a "thin" transparency is preferred. When the transparency is received from the developing laboratory, it is placed, emulsion down, against the glossy side of fixed-out Eastman white topographic film and observed for general effect.

If the immediate result is slightly dark, the following chemical treatment is given to the transparency: It is soaked in distilled water at 76° F. for 5 minutes. Then it is placed in a solution, 1 percent by weight, of sodium hydrosulfite. This gradually reduces the density of the dye deposit. At periodic intervals the transparency is removed, rinsed in distilled water, placed against a white background, and checked for effect.

When the desired density is reached, the transparency is thoroughly washed in water and hung to dry. After it is dry, it is ready for mounting, as follows:

The transparency is pressed, emulsion side, to Eastman white topographic fixed-out film. This is placed between a piece of clean glass for the front and another piece of glass or flat material for the back, and bound with cellophane tape. The resultant picture gives satisfactory rendition of skin tones and detail.

Copies and enlargements can be made from this mounting with a process camera, using the factors of exposure described above for taking the original. Enlargements from small transparencies may be made onto sheet Kodachrome with proper filters and resultant transparency processed as described above.

The resulting picture shows no screen or grain, and detail can be studied with a hand magnifying lens.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

September 7–October 4, 1941

The accompanying tables summarize the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." Table 1 gives the number of cases of poliomyelitis reported by each State in recent weeks of 1941, and table 2 gives the number of cases of nine important communicable diseases,

including poliomyelitis, for the 4-week period ended October 4, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—An increase over the preceding 4-week period of approximately 1,000 cases of influenza was reported during the 4 weeks ended October 4. The increases appeared to be largely due to an excess of cases in a few widely scattered States, viz, Texas, South Carolina, Virginia, Wisconsin, Colorado, Arizona, and California. An increase in influenza cases is normally expected at this season of the year, but the current increase for the country as a whole is slightly above that during preceding years. No unusual prevalence was reported from any State in the North Atlantic, West North Central, or East South Central regions and the incidence in those areas was below the seasonal expectancy.

Poliomyelitis.—The number of reported cases of poliomyelitis dropped from 2,370 for the preceding 4-week period to 2,239 for the current 4-week period. The incidence was approximately 80 percent of that recorded during the corresponding period in 1940, but it was more than one and one-fifth times the 1936–40 median incidence for this period. In States in the South Atlantic and East South Central regions, where the current rise of this disease started, the number of cases declined considerably during the current period, but in the North Atlantic regions the highest incidence of the season was reported during the first weeks of the period. In Georgia the number of cases dropped from a peak of 242 for the preceding 4 weeks to 76 for the current period; in Florida, from 44 to 26; in Tennessee from 143 to 119; in Alabama from 291 to 152; and in Kentucky from 73 to 33 cases. New York reported an increase from 255 cases for the preceding 4 weeks to 424 cases for the 4 weeks ended October 4; New Jersey an increase from 103 to 119; and Connecticut from 25 to 53. Pennsylvania reported 250 cases as compared with 258 for the preceding 4 weeks.

The 1940 epidemic of poliomyelitis was confined largely to the North Central and South Atlantic regions. The North Central regions, especially the West North Central States, have been little affected by the current outbreak. The first increase of cases during the present year was reported from States in the South Atlantic region. In the West South Central, Mountain, and Pacific regions the incidence was considerably below the normal seasonal expectancy; there has been no serious outbreak of this disease in the West South Central region since 1937 and none in the Mountain and Pacific regions since 1934.

The accompanying table gives the number of cases of poliomyelitis reported by weeks in each State since the beginning of the current outbreak. Starting in Florida the disease spread into Georgia and

then into the East South Central States but did not reach other States in the South Atlantic and the North Atlantic regions until about the middle of August. In preceding years a sharp decline in the incidence of this disease has usually occurred during the period following the one now under consideration. For the weeks ended October 11 and October 18 (the latest reports available) there were 429 and 312 cases reported.

TABLE 1.—*Poliomyelitis cases reported in each State during recent weeks of 1941*

Division and State	Week ended—															
	June 21	June 28	July 5	July 12	July 19	July 26	Aug. 2	Aug. 9	Aug. 16	Aug. 23	Aug. 30	Sept. 6	Sept. 13	Sept. 20	Sept. 27	Oct. 4
United States	67	79	82	187	246	302	326	422	549	611	624	586	595	596	592	456
New England:																
Maine	0	0	0	0	0	0	4	0	0	2	4	2	3	0	5	7
New Hampshire	0	0	0	0	0	0	0	1	0	0	2	1	7	3	0	2
Vermont	1	0	0	0	0	0	0	1	2	0	3	0	1	1	0	1
Massachusetts	0	0	0	0	0	2	5	4	11	8	21	18	16	20	15	10
Rhode Island	0	0	0	0	0	0	1	0	2	4	5	0	2	3	1	1
Connecticut	1	0	0	0	0	2	6	1	7	7	5	6	19	10	12	12
Middle Atlantic:																
New York	0	4	3	2	6	11	12	30	49	66	69	71	109	113	115	87
New Jersey	1	0	1	0	5	2	5	13	17	25	29	32	41	27	29	22
Pennsylvania	1	1	4	7	6	8	15	17	45	82	65	66	63	70	66	51
East North Central:																
Ohio	3	0	1	3	0	11	16	27	37	44	36	33	35	34	42	32
Indiana	0	0	0	1	2	8	5	12	5	7	6	4	7	16	10	1
Illinois	7	0	5	9	5	4	13	8	18	23	31	21	25	25	31	18
Michigan	1	0	0	3	6	7	8	10	16	6	26	7	20	20	26	19
Wisconsin	0	0	0	0	0	0	3	1	5	2	3	6	6	1	8	2
West North Central:																
Minnesota	2	1	2	6	1	5	3	12	14	14	21	23	24	24	16	15
Iowa	0	0	0	2	4	3	1	0	5	2	0	3	0	2	0	2
Missouri	0	0	0	1	0	0	1	0	4	0	5	1	1	5	4	0
North Dakota	0	0	0	0	1	0	0	0	0	0	0	4	1	0	0	1
South Dakota	1	0	0	2	1	0	5	0	0	0	3	1	0	0	2	1
Nebraska	0	0	0	0	0	2	0	0	0	0	0	0	1	1	8	0
Kansas	0	0	0	0	0	0	0	1	1	1	3	6	1	5	2	0
South Atlantic:																
Delaware	0	0	0	0	0	0	0	0	2	2	0	0	0	1	4	0
Maryland	0	0	0	1	4	3	14	11	16	21	32	16	17	24	15	18
District of Columbia	0	0	0	0	1	1	0	2	8	6	8	7	3	2	3	12
Virginia	0	2	0	5	2	3	4	3	7	9	5	15	11	4	8	10
West Virginia	0	2	0	0	0	1	1	1	0	1	4	2	2	1	4	1
North Carolina	1	1	1	0	8	5	0	10	16	4	10	12	9	8	10	7
South Carolina	3	2	3	13	9	5	5	16	11	8	8	10	8	11	11	8
Georgia	9	23	19	40	91	79	71	71	69	74	50	49	26	22	17	11
Florida	15	10	6	11	13	16	27	13	10	14	16	4	4	6	9	7
East South Central:																
Kentucky	1	0	2	10	4	11	7	13	15	25	15	18	14	7	6	6
Tennessee	0	1	0	5	12	24	13	31	37	30	29	38	29	24	39	27
Alabama	3	10	22	40	46	58	49	80	82	78	65	66	38	57	35	22
Mississippi	4	5	6	2	12	10	9	10	11	5	12	10	5	5	3	7
West South Central:																
Arkansas	0	0	0	0	1	2	1	3	4	1	3	1	5	2	1	4
Louisiana	1	3	0	1	2	2	5	2	3	7	3	3	1	2	4	1
Oklahoma	1	1	0	1	0	1	0	1	0	1	2	1	2	3	2	3
Texas	2	2	4	8	1	3	4	4	3	2	5	3	4	2	5	4
Mountain:																
Montana	0	1	0	0	1	1	0	0	1	0	3	1	2	0	0	1
Idaho	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0
Wyoming	1	1	0	0	0	1	0	0	1	0	0	2	0	0	0	0
Colorado	0	1	0	0	0	0	2	1	0	1	0	3	6	4	1	1
New Mexico	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	1
Arizona	1	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0
Utah	0	0	0	0	0	1	1	2	3	1	3	4	3	2	3	1
Nevada	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific:																
Washington	0	0	0	5	0	0	1	3	4	0	0	2	8	5	4	7
Oregon	7	0	0	1	0	0	1	0	3	3	5	6	6	12	5	8
California	9	7	3	8	1	9	8	7	5	16	6	7	8	10	10	5

Whooping cough.—For the current 4-week period there were 13,015 cases of whooping cough reported, as compared with 10,726 for the corresponding period in 1940, which figure also represents the 1938–40 average incidence for this period. Each section of the country except the Middle Atlantic reported a relatively large number of cases, the increases over the normal seasonal incidence ranging from about 10 percent in the South Atlantic region to approximately 60 percent in the Mountain and Pacific regions.

Measles.—The number of cases (3,200) of measles reported for the current period was almost 20 percent in excess of the 1936–40 average incidence for this period. Each section of the country except the West North Central contributed to the excess. The disease still remained unusually prevalent in the South Atlantic region, the number of cases there being more than three and one-half times the normal seasonal incidence.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended October 4, there were 1,759 cases of diphtheria reported, an increase of approximately 30 percent over the number reported during the corresponding period in 1940. However, the number was considerably below the 1936–40 average incidence (2,296 cases) for this period. In the New England, West North Central, West South Central, and Mountain regions the incidence stood at about the normal seasonal level, but in all other regions the incidence was comparatively low.

Meningococcus meningitis.—The number of cases of meningococcus meningitis was also relatively low, 103 cases as compared with 107 in 1940 and an average of 113 cases for the corresponding period in the years 1936–40. In the New England region, although the number of cases (14) was not large, it was twice the average seasonal expectancy; in the Middle Atlantic, South Atlantic, West South Central, and Pacific regions the incidence was about normal, and in the North Central, South Central, and Mountain regions the incidence was relatively low.

Scarlet fever.—The number of cases (4,281) of scarlet fever reported for the current period was the lowest recorded for this period in the 13 years for which these data are available. Each section of the country shared in this favorable situation except the New England section; there an increase over the normal seasonal expectancy of about 25 percent was reported.

Smallpox.—The incidence of smallpox remained at a comparatively low level. For the current period 21 cases were reported as compared with the record low level of 48 cases reported for the corresponding period in 1940, and an average of 125 cases in the years 1936–40. In

the North Central, Mountain, and Pacifi regions the current incidence was the lowest on record for this period.

TABLE 2.—*Number of reported cases of 9 communicable diseases in the United States during the 4-week period September 7–October 4, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period, 1936–40*

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	1,759	1,316	2,296	3,358	2,165	1,955	3,200	2,816	2,816
New England	25	16	31	3	9	9	304	333	215
Middle Atlantic	69	95	154	18	28	55	622	769	389
East North Central	161	138	276	225	204	204	519	684	506
West North Central	110	83	113	29	41	117	164	177	177
South Atlantic	707	406	971	936	790	781	572	151	151
East South Central	273	196	453	55	256	163	187	191	121
West South Central	294	240	200	1,642	531	531	260	92	110
Mountain	67	49	64	300	205	136	213	208	208
Pacific	53	93	93	150	101	101	359	211	211
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	103	107	113	2,230	2,859	1,844	4,281	4,808	5,357
New England	14	11	7	151	26	26	355	218	286
Middle Atlantic	20	25	28	793	120	120	625	796	851
East North Central	5	19	19	378	1,147	417	1,113	1,439	1,588
West North Central	5	9	9	116	868	270	482	519	680
South Atlantic	25	15	27	314	318	83	650	629	790
East South Central	7	10	18	324	78	57	426	474	456
West South Central	9	8	10	45	76	65	154	186	186
Mountain	4	3	7	30	71	71	156	172	223
Pacific	5	7	7	88	125	125	320	375	496
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	21	48	125	1,216	1,444	1,737	13,015	10,726	[3]10,726
New England	0	0	0	20	21	32	978	775	775
Middle Atlantic	0	0	0	190	155	207	2,835	2,732	2,856
East North Central	7	9	25	142	158	341	4,197	3,009	3,009
West North Central	5	30	30	83	124	124	823	585	578
South Atlantic	1	0	4	273	207	357	1,288	1,160	1,160
East South Central	6	2	7	167	222	222	509	496	436
West South Central	1	3	9	234	339	385	509	535	420
Mountain	1	2	38	46	79	132	701	267	446
Pacific	0	2	10	52	49	90	1,175	1,167	742

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three year (1938–40) median.

Typhoid fever.—The number of cases (1,216) of typhoid fever was only about 85 percent of last year's figure for the corresponding period and approximately 70 percent of the 1936–40 median incidence. The incidence for the country as a whole was the lowest in recent years and each section of the country shared in this favorable situation.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended October 4, based on data received from the Bureau of the Census, was 10.2 per 1,000 inhabitants (annual basis). The rate for the corresponding period last year was 10.6 and the average rate in the years 1938–40 was 10.7.

DEATHS DURING WEEK ENDED OCTOBER 11, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Oct. 11, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,783	7,764
Average for 3 prior years	7,776	
Total deaths, first 41 weeks of year	344,153	345,231
Deaths per 1,000 population, first 41 weeks of year, annual rate	11.7	11.8
Deaths under 1 year of age	554	499
Average for 3 prior years	504	
Deaths under 1 year of age, first 41 weeks of year	21,548	20,566
Data from industrial insurance companies:		
Policies in force	64,520,321	64,819,862
Number of death claims	9,924	10,763
Death claims per 1,000 policies in force, annual rate	8.0	8.7
Death claims per 1,000 policies, first 41 weeks of year, annual rate	9.5	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 18, 1941

Summary

The number of reported cases of poliomyelitis dropped to 312 for the current week as compared with 429 for the preceding week. The largest numerical decrease occurred in the Middle Atlantic States, where the number of cases dropped from 146 to 97 cases, all three States in the area (New York, New Jersey, and Pennsylvania) reporting decreased incidence. The largest increases were in Georgia (6 to 18) and Alabama (17 to 22). Only six States reported 15 or more cases, as follows (last week's figures in parentheses): New York 55 (79), Pennsylvania 30 (42), Alabama 22 (17), Georgia 18 (6), Tennessee 17 (16), Illinois 16 (25). The largest weekly number of cases (624) was reported for the week ended August 30.

A total of 1,131 cases of influenza was reported for the week as compared with 995 for the preceding week and with a 5-year (1936–40) median of 717 for the corresponding week. Texas reported 529 cases, or about half of the total for the current week, while South Carolina reported 151 cases and Virginia 104. The disease has been slightly above the median expectancy continuously during the past summer, due to the unusually large number of cases reported in Texas.

While for the country as a whole diphtheria is below the median expectancy, considerably larger numbers of cases as compared with last year are being reported from the South Atlantic and South Central areas, where the incidence has notably increased during recent weeks. Of 662 cases reported currently, 490, or 74 percent, occurred in these areas, of which 101 cases were in North Carolina.

Of 110 cases of endemic typhus fever, 46 were reported in Georgia and 29 in Texas.

The crude death rate for the current week for 88 large cities in the United States is 10.6 per 1,000 population as compared with 10.9 for both the preceding week and the 3-year average for the corresponding week. The cumulative rate to date, first 42 weeks, is 11.7, the same as for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended October 18, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940	
NEW ENG.												
Maine	0	0	3	-------	-------	1	31	63	18	0	0	0
New Hampshire	0	0	0	-------	-------	-------	10	0	2	0	0	0
Vermont	0	0	0	-------	-------	-------	1	10	3	0	0	0
Massachusetts	0	9	3	-------	-------	-------	82	143	71	3	2	1
Rhode Island	2	1	1	-------	-------	-------	3	1	1	0	0	0
Connecticut	1	0	2	-------	1	2	11	2	6	0	0	0
MID. ATL.												
New York [2]	15	14	17	[1] 4	[1] 2	[1] 11	80	138	91	2	1	8
New Jersey	3	9	9	6	3	5	22	84	33	0	0	0
Pennsylvania	9	12	24	-------	-------	-------	110	368	135	7	2	2
E. NO. CEN.												
Ohio	5	21	30	3	19	4	26	14	11	1	1	3
Indiana	17	12	23	14	3	14	5	9	5	0	0	1
Illinois [3]	20	18	27	9	2	8	29	78	13	1	1	3
Michigan [4]	18	2	5	-------	1	-------	35	133	39	0	0	1
Wisconsin	1	0	2	16	35	33	51	179	20	0	3	0
W. NO. CEN.												
Minnesota	10	0	13	3	-------	1	10	0	8	0	0	0
Iowa	0	5	5	7	1	1	12	26	8	0	0	0
Missouri	11	10	26	-------	-------	10	9	5	5	2	0	1
North Dakota	1	6	1	-------	7	2	37	1	1	0	1	0
South Dakota	8	0	0	-------	-------	-------	0	4	4	0	0	0
Nebraska	7	3	4	-------	-------	-------	4	14	1	0	1	1
Kansas	4	1	7	7	1	3	2	8	4	0	1	0
SO. ATL.												
Delaware	3	1	1	-------	-------	-------	0	2	0	0	0	0
Maryland [4]	7	3	8	1	1	7	11	2	3	3	0	1
Dist. of Col.	2	0	5	-------	-------	-------	4	0	1	0	0	0
Virginia	33	16	77	104	70	33	20	35	6	1	4	4
West Virginia	12	8	29	10	15	15	45	2	2	1	1	1
North Carolina [2]	101	67	143	1	2	4	73	3	80	0	0	1
South Carolina [2]	63	17	17	151	103	140	16	2	2	0	0	0
Georgia [2]	30	28	53	25	16	16	7	1	0	1	0	0
Florida [2]	11	8	8	25	1	2	9	0	2	0	0	0
E. SO. CEN.												
Kentucky	15	17	27	-------	18	9	32	19	3	1	0	2
Tennessee [2]	40	16	60	3	16	22	20	0	8	1	1	1
Alabama [2]	29	28	35	18	16	26	9	3	3	1	0	2
Mississippi [2,4]	11	16	22	-------	-------	-------	-------	-------	-------	0	1	1
W. SO. CEN.												
Arkansas	20	14	26	13	16	18	16	3	2	1	0	0
Louisiana [2]	22	12	20	3	2	3	1	0	1	0	0	0
Oklahoma	13	22	14	35	30	30	11	2	2	0	0	0
Texas [2]	78	39	39	529	231	123	14	17	17	0	1	2
MOUNTAIN												
Montana	5	1	1	2	14	15	3	14	13	0	0	0
Idaho	0	2	0	-------	-------	1	1	3	19	0	1	0
Wyoming [3]	1	0	0	9	-------	-------	1	5	1	0	1	0
Colorado	13	8	8	16	7	7	30	19	19	0	0	0
New Mexico	1	0	3	1	-------	1	19	7	9	0	0	0
Arizona	2	2	5	51	81	53	10	16	1	0	0	0
Utah [4]	0	1	1	2	6	1	3	3	4	1	1	0
Nevada	0	0	-------	-------	-------	-------	0	0	-------	0	0	-------
PACIFIC												
Washington	0	5	2	-------	-------	-------	6	5	6	0	0	0
Oregon	0	5	1	18	14	14	13	12	7	0	0	0
California [2]	18	23	37	45	14	15	98	48	48	1	1	2
Total	662	482	883	1,131	748	717	1,042	1,503	1,313	28	25	45
42 weeks	11,367	11,697	19,558	574,440	174,065	156,030	838,324	235,896	273,299	1,673	1,391	2,450

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 18, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940		Oct. 18, 1941	Oct. 19, 1940	
NEW ENG.												
Maine	0	0	0	11	4	12	0	0	0	0	0	2
New Hampshire	2	0	0	28	6	2	0	0	0	3	0	0
Vermont	1	0	0	4	9	4	0	0	0	0	1	0
Massachusetts	7	1	2	94	74	72	0	0	0	0	2	2
Rhode Island	3	1	0	4	0	7	0	0	0	0	0	1
Connecticut	5	0	1	6	23	23	0	0	0	0	1	1
MID. ATL.												
New York [3]	55	13	14	90	123	187	0	0	0	9	14	18
New Jersey	12	11	5	54	66	51	0	0	0	3	2	3
Pennsylvania	30	7	7	89	122	179	0	0	0	17	20	37
E. NO. CEN.												
Ohio	14	36	6	130	106	185	0	0	0	10	9	16
Indiana	1	21	3	81	76	103	1	0	2	2	4	4
Illinois [3]	16	42	10	125	168	177	1	3	1	6	5	9
Michigan [4]	11	81	12	100	147	165	0	0	0	13	3	3
Wisconsin	4	29	7	66	97	97	1	0	0	4	1	1
W. NO. CEN.												
Minnesota	11	18	18	35	45	53	0	3	3	0	0	0
Iowa	4	55	11	43	52	59	0	0	1	5	3	3
Missouri	1	18	8	65	27	57	0	1	1	8	3	5
North Dakota	2	3	2	8	11	14	0	4	4	2	2	2
South Dakota	0	4	1	11	18	21	0	0	0	1	0	0
Nebraska	0	8	2	10	19	19	0	1	1	0	0	0
Kansas	4	23	2	49	62	75	0	0	0	4	3	2
SO. ATL.												
Delaware	0	0	0	6	1	5	0	0	0	0	1	1
Maryland [4]	7	0	2	23	35	39	0	0	0	10	8	8
Dist. of Col.	4	0	1	14	14	12	0	0	0	1	0	0
Virginia	6	16	2	37	32	38	0	0	0	8	12	12
West Virginia	3	37	3	64	38	80	0	0	0	9	3	7
North Carolina [2]	10	5	3	93	70	84	0	0	0	6	5	8
South Carolina [2]	6	0	0	11	9	13	0	0	0	1	4	6
Georgia [2]	18	0	1	33	53	35	0	0	0	1	17	10
Florida [2]	3	1	1	6	1	8	0	0	0	1	2	2
E. SO. CEN.												
Kentucky	5	12	4	46	56	56	0	0	0	10	11	11
Tennessee [2]	17	1	1	108	82	62	1	1	0	21	5	14
Alabama [2]	22	2	2	52	31	31	0	0	0	2	6	5
Mississippi [2, 4]	6	0	0	14	20	18	1	0	0	4	5	6
W. SO. CEN.												
Arkansas	2	1	3	7	26	20	3	0	0	8	19	9
Louisiana [2]	1	5	1	6	15	8	0	0	0	5	8	14
Oklahoma	0	3	2	14	23	23	1	0	1	6	5	12
Texas [2]	6	7	7	26	40	40	0	0	0	25	13	21
MOUNTAIN												
Montana	1	4	0	12	14	19	0	0	3	1	2	2
Idaho	0	5	1	4	14	17	0	0	0	0	4	3
Wyoming [3]	1	1	0	2	4	6	0	0	0	1	0	0
Colorado	0	6	6	29	15	20	0	1	1	8	3	3
New Mexico	0	2	2	8	2	14	0	0	0	3	9	15
Arizona	0	0	0	2	1	6	0	0	0	0	0	3
Utah [4]	1	2	2	9	6	13	0	0	0	0	0	0
Nevada	0	0	------	0	0	------	0	0	------	0	0	------
PACIFIC												
Washington	1	18	3	25	23	23	0	0	1	2	4	4
Oregon	3	5	4	5	16	15	0	1	1	3	0	3
California [2]	6	10	13	87	89	149	0	0	3	4	12	10
Total	312	514	246	1,846	1,985	2,277	9	15	51	227	231	330
42 weeks	7,591	7,949	5,998	101,336	129,251	151,570	1,230	2,061	8,546	7,241	8,160	11,848

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 18, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended— Oct. 18, 1941	Whooping cough, Week ended— Oct. 19, 1940
NEW ENG.		
Maine	9	8
New Hampshire	7	1
Vermont	3	1
Massachusetts	94	175
Rhode Island	0	6
Connecticut	83	88
MID. ATL.		
New York [1]	287	329
New Jersey	143	123
Pennsylvania	233	558
E. NO. CEN.		
Ohio	226	261
Indiana	14	28
Illinois [3]	190	119
Michigan [4]	233	371
Wisconsin	231	113
W. NO. CEN.		
Minnesota	56	42
Iowa	15	16
Missouri	36	7
North Dakota	12	34
South Dakota	10	0
Nebraska	6	2
Kansas	52	87
SO. ATL.		
Delaware	0	3
Maryland [4]	82	93
Dist. of Col	25	2
Virginia	17	31
West Virginia	16	25
North Carolina [2]	112	99
SO. ATL.—continued		
South Carolina [2]	62	22
Georgia [2]	19	9
Florida [2]	25	1
E. SO. CEN.		
Kentucky	40	56
Tennessee [2]	33	31
Alabama [2]	16	9
Mississippi [2 4]		
W. SO. CEN.		
Arkansas	15	12
Louisiana [2]	3	8
Oklahoma	11	12
Texas [2]	93	119
MOUNTAIN		
Montana	14	3
Idaho	5	4
Wyoming [3]	3	0
Colorado	69	13
New Mexico	21	17
Arizona	5	12
Utah [4]	18	7
Nevada	5	0
PACIFIC		
Washington	43	80
Oregon	34	13
California [2]	181	249
Total	2,807	3,329
42 weeks	174,520	131,501

[1] New York City only.
[2] Typhus fever, week ended Oct. 18, 1941, 110 cases, as follows: New York, 2; North Carolina, 2; South Carolina, 2; Georgia, 46; Florida, 3; Tennessee, 7; Alabama, 9; Mississippi, 3; Louisiana, 6; Texas, 29; California, 1.
[3] Rocky Mountain spotted fever, week ended Oct. 18, 1941, 8 cases, as follows: Illinois, 2; Wyoming, 6 (delayed reports).
[4] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended October 4, 1941

This table lists the reports from 128 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	1	2	0	0	0	5	25
New Hampshire:											
Concord	0	------	0	0	0	1	0	1	0	0	6
Manchester	0	------	0	0	0	2	0	0	0	0	9
Nashua	0	------	0	0	1	0	0	0	0	1	6
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	0	------	0	2	10	21	0	8	3	18	193
Fall River	5	------	0	0	2	5	0	1	0	0	18
Springfield	0	------	0	3	0	10	0	0	0	8	32
Worcester	0	------	0	0	4	3	0	2	0	5	47
Rhode Island:											
Pawtucket	0	------	0	2	0	0	0	0	0	1	9
Providence	0	------	0	0	1	0	0	1	0	30	56
Connecticut:											
Bridgeport	0	------	0	4	0	1	0	1	0	2	29
Hartford	0	------	0	0	0	1	0	0	0	2	30
New Haven	0	------	0	0	1	0	0	0	0	3	24
New York:											
Buffalo	1	------	0	0	9	10	0	10	0	13	126
New York	6	------	1	9	40	36	0	53	4	193	1,236
Rochester	0	------	0	0	2	5	0	1	0	5	62
Syracuse	0	------	0	0	3	1	0	2	0	13	51
New Jersey:											
Camden	0	------	0	0	0	0	0	0	3	0	22
Newark	0	------	0	2	1	15	0	5	0	27	82
Trenton	0	------	0	0	1	3	0	2	2	1	44
Pennsylvania:											
Philadelphia	0	------	0	2	11	18	0	28	3	51	417
Pittsburgh	3	------	0	2	6	6	0	8	1	28	139
Reading	0	------	0	1	1	0	0	0	0	0	23
Scranton	0	------	------	2	------	0	0	------	0	1	------
Ohio:											
Cincinnati	0	------	0	0	1	3	0	2	0	18	80
Cleveland	0	2	0	0	3	7	0	8	0	33	190
Columbus	0	------	0	1	1	15	0	3	0	15	89
Toledo	0	1	0	0	4	5	0	5	0	15	71
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	6
Fort Wayne	0	------	0	0	2	1	0	0	0	0	20
Indianapolis	5	------	0	1	3	8	0	3	0	6	71
South Bend	0	------	0	0	0	0	0	0	0	0	14
Terre Haute	0	------	0	0	1	0	0	1	0	0	11
Illinois:											
Alton	0	------	0	0	0	0	0	0	0	0	16
Chicago	9	1	0	8	16	27	0	30	0	106	645
Elgin	0	------	0	0	0	0	0	0	0	3	10
Springfield	0	------	0	0	1	1	0	1	0	1	13
Michigan:											
Detroit	6	------	0	48	4	29	0	11	0	116	230
Flint	1	------	0	1	3	1	0	1	0	5	21
Grand Rapids	0	------	0	0	1	1	0	1	0	8	31
Wisconsin:											
Kenosha	0	------	0	0	0	3	0	0	0	4	8
Milwaukee	0	------	0	5	0	16	0	7	0	89	109
Racine	0	------	0	1	0	6	0	0	0	2	12
Superior	0	------	0	0	0	0	0	0	0	2	10
Minnesota:											
Duluth	0	------	0	2	0	1	0	0	0	6	28
Minneapolis	0	------	0	2	0	7	0	0	0	20	74
St. Paul	0	------	0	1	4	3	0	1	0	17	64
Iowa:											
Cedar Rapids	0	------	------	0	------	2	0	------	0	0	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	1	------	0	0	0	1	0	0	0	0	26
Sioux City	1	------	------	0	------	1	0	------	0	2	------
Waterloo	0	------	------	0	------	2	0	------	0	2	------

City reports for week ended October 4, 1941— Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Missouri:											
Kansas City	0	------	0	2	3	4	0	3	0	1	104
St. Joseph	0	------	0	1	2	1	0	0	0	0	28
St. Louis	0	------	0	1	3	7	0	9	1	4	339
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	0	11
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	0	0	0	0	0	0	1	5
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	1	------
Nebraska:											
Lincoln	0	------	------	0	------	0	0	------	0	1	------
Omaha	0	------	0	0	1	2	0	1	0	1	43
Kansas:											
Lawrence	0	2	0	0	0	1	0	0	0	0	3
Topeka	0	------	0	0	1	1	0	2	0	3	30
Wichita	0	------	0	0	2	8	0	1	0	1	30
Delaware:											
Wilmington	0	------	0	0	2	2	0	0	0	1	24
Maryland:											
Baltimore	1	------	0	13	5	8	0	8	0	45	192
Cumberland	0	------	0	0	1	0	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	0	0	0	2
Dist. of Columbia	7	------	0	3	6	17	0	2	2	15	144
Virginia:											
Lynchburg	2	------	0	0	1	0	0	1	0	5	16
Norfolk	1	------	0	1	2	3	0	0	0	2	24
Richmond	0	------	0	0	2	1	0	3	0	0	49
Roanoke	0	------	0	0	0	0	0	0	0	0	11
West Virginia:											
Charleston	0	------	0	1	2	1	0	0	1	1	12
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	1	0	1	0	0	0	0	26
North Carolina:											
Raleigh	1	------	0	0	0	1	0	0	0	5	18
Wilmington	2	------	0	0	4	3	0	1	0	3	10
Winston-Salem	8	------	0	0	1	4	0	1	0	0	21
South Carolina:											
Charleston	0	6	0	0	0	1	0	0	3	1	10
Florence	0	------	1	2	0	1	0	0	0	0	5
Greenville	0	------	0	0	0	1	0	0	0	2	21
Georgia:											
Atlanta	0	12	0	0	4	11	0	5	0	0	75
Brunswick	0	------	0	0	0	0	0	0	0	6	3
Savannah	0	1	0	1	2	0	0	2	1	0	27
Florida:											
Miami	0	1	0	0	0	0	0	0	1	2	29
St. Petersburg	0	------	0	0	1	0	0	0	0	0	19
Tampa	0	------	0	0	0	1	0	0	0	4	23
Kentucky:											
Ashland	0	------	0	0	0	1	0	1	0	0	12
Covington	0	------	0	0	0	2	0	1	0	0	8
Lexington	0	------	0	0	0	1	0	2	0	0	13
Tennessee:											
Knoxville	0	------	0	0	1	0	0	2	0	0	25
Memphis	0	------	0	0	2	1	0	3	1	1	76
Nashville	0	------	1	0	4	4	0	3	1	3	45
Alabama:											
Birmingham	2	------	0	0	5	5	0	2	2	0	66
Mobile	1	------	0	0	0	2	0	0	0	0	23
Montgomery	2	------	------	0	------	5	------	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	1	------
Little Rock	0	8	0	0	1	0	0	2	0	0	30
Louisiana:											
New Orleans	1	1	0	0	13	0	0	8	1	1	129
Shreveport	1	------	0	0	2	0	0	4	0	0	34
Oklahoma:											
Oklahoma City	0	1	0	0	1	1	0	1	0	0	29
Tulsa	1	------	0	1	0	2	0	0	0	2	17
Texas:											
Dallas	9	------	0	2	1	5	0	1	0	7	57
Fort Worth	8	------	0	0	0	1	0	1	0	0	44
Galveston	0	------	0	0	3	0	0	2	0	0	16
Houston	0	------	0	0	8	0	0	5	0	8	73
San Antonio	0	2	0	0	6	0	0	6	0	1	55

City reports for week ended October 4, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	11
Great Falls	0	------	0	1	2	0	0	0	0	0	8
Helena	0	------	0	0	0	0	0	0	0	0	2
Missoula	0	------	0	0	1	0	0	0	0	0	3
Colorado:											
Denver	2	15	0	1	1	1	0	2	0	44	71
Pueblo	0	------	0	4	0	1	0	0	0	1	7
New Mexico:											
Albuquerque	0	1	0	0	0	0	0	0	0	11	9
Arizona:											
Phoenix	1	15	--------	0	--------	0	0	--------	0	5	--------
Utah:											
Salt Lake City	0	------	0	0	1	2	0	1	0	9	29
Washington:											
Seattle	0	------	0	0	0	2	0	2	0	17	78
Spokane	0	------	0	0	1	15	0	0	0	2	35
Tacoma	0	------	0	0	0	0	0	1	0	0	26
Oregon:											
Portland	0	------	0	0	4	6	0	0	0	2	91
Salem	0	1	--------	0	--------	0	0	--------	0	0	--------
California:											
Los Angeles	5	8	2	4	2	14	0	17	0	19	360
Sacramento	0	------	0	0	1	1	0	0	2	6	53
San Francisco	0	4	0	6	4	2	0	8	0	13	189

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Maine:			
Portland	0	0	1
Massachusetts:			
Boston	1	0	9
Rhode Island:			
Providence	0	0	1
Connecticut:			
Bridgeport	0	0	1
New York:			
Buffalo	0	0	2
New York	3	0	25
Rochester	0	0	10
Syracuse	0	0	3
New Jersey:			
Camden	0	0	1
Pennsylvania:			
Philadelphia	0	0	6
Pittsburgh	0	0	3
Reading	0	0	1
Ohio:			
Cincinnati	0	0	1
Cleveland	0	0	7
Columbus	0	0	1
Illinois:			
Chicago	0	0	8
Elgin	0	0	1
Michigan:			
Detroit	0	0	21
Grand Rapids	0	0	1
Minnesota:			
Minneapolis	0	0	2
St. Paul	0	0	7
Maryland:			
Baltimore	1	0	4
Frederick	0	0	1
District of Columbia:			
Washington	0	0	12
Florida:			
St. Petersburg	0	0	1
Tennessee:			
Nashville	0	0	4
Alabama:			
Birmingham	0	0	1
Mobile	0	0	2
Montgomery	0	0	1
Arkansas:			
Fort Smith	0	0	1
Oklahoma:			
Tulsa	0	0	2
Texas:			
Houston	0	1	0
San Antonio	0	0	1
Oregon:			
Portland	0	0	5
California:			
Los Angeles	0	0	1

Dengue.—Cases: Charleston, S. C., 1.

Encephalitis, epidemic or lethargic.—Cases: Minneapolis, 1; St. Paul, 1; Wichita, 1; Norfolk, 1. Deaths: New York, 1; Minneapolis, 3; Topeka, 1; Wichita, 1.

Pellagra.—Cases: Charleston, S. C., 1; Savannah, 2; San Antonio, 1.

Typhus fever.—Cases: New York, 2; Savannah, 2; Nashville, 1; Birmingham, 2; New Orleans, 2; Dallas, 2; San Antonio, 1.

Rates (annual basis) per 100,000 population for a group of 89 selected cities (population, 1940, 33,902,982)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Oct. 4, 1941	12.00	8.46	0.62	21.07	35.53	60.14	0.00	45.83	4.77	166.72
Average for week, 1936-40	17.57	8.71	2.80	34.51	52.23	71.66	.47	49.12	8.24	151.10

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on September 12, 1941, and another found on September 18, both in the Paauhau area of Hamakua District, Island of Hawaii, T. H., have been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 13, 1941.—During the week ended September 13, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		4			4	1			2	11
Chickenpox		5		11	37	4	3		15	75
Diphtheria	1	11	1	35	7	2	2			59
Dysentery				16					7	23
Influenza		3								3
Lethargic encephalitis						10	[1] 61	5		76
Measles				47	12	2	16	8	17	97
Mumps				55	28	14	21	4	12	134
Pneumonia		2			3	1			3	9
Poliomyelitis		8	24	4	4	31	3	17	5	91
Scarlet fever		3	2	65	92	8	6	13	3	192
Trachoma									1	1
Tuberculosis	2	8	12	61	44	8	7			142
Typhoid and paratyphoid fever				51	6	1	74	4	3	139
Whooping cough	6	16	5	89	105		7	3	22	253

[1] Encephalomyelitis.

JAMAICA

Communicable diseases—4 weeks ended September 27, 1941.—During the 4 weeks ended September 27, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	3	7	Erysipelas	1	
Diphtheria	1		Tuberculosis	26	79
Dysentery	2	1	Typhoid fever	16	16

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently. A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Chile—Valparaiso.—According to a cablegram dated October 11, 1941, received from the Director of Health of Chile, 1 case of plague was reported in Valparaiso.

Peru—Lima Department.—During the month of August 1941, plague was reported in Lima Department, Peru, as follows: Huaura, 1 case, 1 death; Sayan, 1 case, 1 death.

Typhus Fever

Puerto Rico—San Juan.—During the week ended September 13, 1941, 1 case of typhus fever was reported in San Juan, Puerto Rico.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Santander Department—Bolivar, August 26, 1 death, August 30, 1 death; Intendencia of Meta—Villavicencio, August 31, 1 death.

* * *

COURT DECISION ON PUBLIC HEALTH

Restoration to employment under local board of health.—(Ohio Supreme Court; *State ex rel. West* v. *Feyler et al., Board of Health,* 34 N.E.2d 441; decided May 14, 1941.) In a mandamus action against the board of health of a city health district in Ohio, the relator sought to be restored to his employment as plumbing inspector and to his position as registrar of vital statistics. There was no statutory office or position under a local board of health known as "plumbing inspector" or "inspector of plumbing." Regarding the office of local registrar of vital statistics, section 201 of the General Code provided in part: "* * * and in cities the city board of health shall appoint a local registrar of vital statistics, and each shall be subject to the rules and regulations of the state registrar, the provisions of this chapter and to the penalties provided by law." Other General Code sections which were relevant to the matter were sections 4408 and 4411-1 which provided, respectively, as follows: "Sec. 4408. In any city health district, the board of health or person or persons performing the duties of a board of health shall appoint for whole or part time service a health commissioner and may appoint such public

health nurses, clerks, physicians, and other persons as they deem necessary." "Sec. 4411-1. The board shall determine the duties and fix the salaries of its employees * * *."

The Supreme Court of Ohio said that it would be apparent from reading the two latter sections that the respondent board (*a*) was authorized, but not required, to make appointments in addition to a whole or part time health commissioner and (*b*) had the power to determine the duties of all employees. In deciding in favor of the board of health the court stated that, as the appointment of relator, the fixing of his duties, and his term of office were matters of discretion resting with the board, there was no clear legal duty on the part of the board to make such appointment or to continue relator's employment. Under the above-mentioned section 201 there was a duty to appoint a local registrar of vital statistics but it was pointed out that no term of office was provided and, as there was no claim of a civil service status, the court said that there was no clear legal duty resting upon the respondents to retain relator in or reappoint him to such office. Furthermore, whether the duties of plumbing inspector and those of local registrar should be combined and discharged by one person was said to be a matter discretionary with the appointing power.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world, (2) articles relating to the cause, prevention, and control of disease, (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 OCTOBER 31, 1941 NUMBER 44

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56* • OCTOBER 31, 1941 • *No. 44

AN EPIDEMIOLOGICAL STUDY OF CALCIFIED PULMONARY LESIONS IN AN OHIO COUNTY[1]

By B. J. OLSON, *Passed Assistant Surgeon*, W. H. WRIGHT, *Chief of Division of Zoology*, and M. O. NOLAN, *Associate Zoologist, United States Public Health Service*

A high prevalence of pulmonary calcification has been found in certain areas of the United States. This phenomenon has been shown by Gass et al. (*1*) and Lumsden and Dearing (*2*) to be particularly common in, or adjacent to, the Appalachian Plateau. The usual interpretation of the finding of pulmonary calcification has been to consider it evidence of primary or first infection tuberculosis, although the above-mentioned workers have shown that approximately half of the young individuals with pulmonary calcification are tuberculin-negative. This observation has aroused considerable interest and some controversy in the attempt to reconcile the lack of tuberculin-positiveness in a large number of young persons with pulmonary calcification. When it is considered that these same investigators found a prevalence of pulmonary calcification up to 50 percent in the population groups studied, the seriousness of their findings should not be underestimated from a public health standpoint if it is correct to assume that a finding of pulmonary calcification is evidence of tuberculous infection.

A remarkable geographic variation in the occurrence of pulmonary calcification in school children was shown by Lumsden and Dearing (*2*) in a study of selected areas of five States. Great differences in the prevalence of pulmonary calcification were shown to exist between States. Differences of similar magnitude occurred in closely adjacent counties of a State. It was observed that this geographic distribution in pulmonary calcification was associated closely with the occurrence of limestone and chert formations.

The recent observations of Dearing et al. (*3*) in a study in Tennessee and Alabama of attack rates from tuberculosis in persons living in a

[1] From the Division of Infectious Diseases and the Division of Zoology, National Institute of Health.

household with a sputum-positive case of tuberculosis revealed the following occurrence of pulmonary calcification in individuals without apparent tuberculous infiltration:

Household associates of sputum-positive cases

State	Total number X-rayed	Number with pulmonary calcification	Percent with pulmonary calcification
Tennessee	156	98	62 8
Alabama	153	16	10 5

It is obvious from this table that there is not a uniform prevalence of pulmonary calcification in household associates of sputum positive cases of tuberculosis in the two areas studied.

The above-mentioned studies demonstrate the occurrence of pulmonary calcification in many individuals who are tuberculin-negative, show a marked geographic variation of pulmonary calcification, and demonstrate the lack of a uniform occurrence of pulmonary calcification in household associates of sputum-positive cases of tuberculosis in two areas studied. These findings suggested the desirability of studying pulmonary calcification as a distinct problem.

The purpose of our study was to attempt to determine the relationship between the presence of pulmonary calcification and exposure to tuberculosis, ascariasis, and other specific diseases. Particular study of the relationship of *Ascaris* infection to pulmonary calcification seemed indicated from the results of our preliminary surveys in Giles County, Tenn., during the fall of 1939.

SELECTION OF STUDY AREA

An area most desirable for study would be one located in, or adjacent to, the Appalachian Plateau, i. e., an area in which pulmonary calcification was of common occurrence, where tuberculosis mortality was not unusually high, where the geology was known, and the families rural in order to evaluate more reliably household exposure. Ross County, Ohio, seemed to fulfill the basic requisites for study.

Ross County, located in south central Ohio, includes within its limits the junction of the Allegheny Plateau of the Appalachian Highlands and the eastern extension of the Till Plains of the Central Lowlands (*4*). In 1940 it had a population of 52,147 of which 20,129 were urban and 32,018 were rural. The county seat, Chillicothe, is located in the center of the county. The local health department is a combined city and county unit. The average annual death rate from tuberculosis for the 14-year period 1926–39 was 46.3 per 100,000. The death rate for 1939 was 24.6 per 100,000. In the calculation of these rates there were excluded the populations of one intercounty

and two Federal institutions located within the county, and the deaths from tuberculosis of nonresidents of the county occurring in these institutions.

The occurrence of pulmonary calcification in parts of Ross County was studied by Lumsden and Dearing (*2*) by an X-ray survey of three county schools. One, the Clarksburg school, was located in the north-central part of the county, and two, the Londonderry and Harrison schools, were in the southeastern part of the county. The school children came from rural areas with the exception of some pupils in the Clarksburg school who lived in the village of Clarksburg (total population, 1940 Census, 390). All pupils in the schools whose parents signed consent slips were X-rayed. No tuberculin tests were made prior to the X-ray examinations. The results of this survey are given in table 1.

TABLE 1.—*Prevalence of pulmonary calcification, demonstrated by X-ray, in school children 5–19 years of age in 3 schools of Ross County, Ohio* [1]

[From original data of Lumsden and Dearing, 1939]

School	Race	Number examined	Pulmonary calcification	
			Present	Absent
Clarksburg	White	294	91	203
	Colored	18	5	13
Harrison and Londonderry	White	191	38	153
Total	White	485	129	356
	Colored	18	5	13

[1] Nine of the 485 white children reported in this survey had additional X-ray findings as follows: Slight widening of cardiac shadow (2 cases); fine granular lesions not diagnostic (2 cases); odd shadow below diaphragm (1 case); old rib resection (1 case); circumscribed homogeneous shadow in right hilum (1 case); azygous lobe (1 case); and chest deformity (1 case).

These tabulations show that 91, or 30.9 percent, of the 294 white children in the Clarksburg school and 38, or 19.9 percent, of the 191 white children in the Harrison-Londonderry schools had pulmonary calcification. Of the 485 white children examined, 129, or 26.6 percent, had demonstrable pulmonary calcification. The difference of 11 percent in the prevalence of pulmonary calcification between the children of the Clarksburg school and the Harrison-Londonderry schools is statistically significant.[2]

PROCEDURE

The index person in the following study was a pupil found to have a pulmonary calcification in the survey of Lumsden and Dearing (*2*). Nothing further was known about the index person or his or her family.

[2] The evaluation of this difference in the prevalence of calcification will be the subject of a later paper in which the duration of residence in various areas of the county is considered in relation to the local geology.

Only rural households living on farms were studied. This selection was made to rule out as far as possible extra-household contact with tuberculosis. All households were visited in turn, the purpose and procedures of the study explained in detail, and cooperation requested. Sixty-eight households were requested to cooperate in the study, which began in the middle of July and ended December 8, 1940. Of these 68 households, 46, or 67 percent, agreed to cooperate and 22, or 33 percent, refused. The reasons for refusals varied.[3] In no instance did a refusal appear to be based on a prior knowledge of known tuberculosis in the family. Two of the 46 families did not keep their appointments for X-ray and were dropped from the study.

It was interesting that most of the families visited had not been under recent care of a physician, nor, in the past, had they been served by the health department except in regard to quarantine in the common communicable diseases.

All households were seen and studied by one of the authors (B.J.O.). The schedule which was developed and used was based on the technique described by Frost (*5*) for household studies. The date of establishment of the households in this study was the date of marriage of the parents of the index person. Particular attention was paid to the occurrence of tuberculosis in each household member.

The family history included an enumeration of the uncles, aunts, and grandparents of the index person. It was ascertained whether these individuals were living or dead at the time of the study, and whether any member had a history of tuberculosis.

Household members present at the time of study were X-rayed when possible, regardless of their medical history with respect to tuberculosis or other pulmonary disease. All X-rays were taken by Dr. R. Holmes, consultant of the United States Public Health Service at Chillicothe, Ohio. With the exception of small babies, all X-rays were taken at a distance of 6 feet on standard 14 x 17 or 10 x 12 films. Inasmuch as most families had to drive 10 to 35 miles for these X-rays, their cooperation was noteworthy. The final readings of all films were made by Dr. R. A. Brown, supervisor of the tuberculosis control section, Division of Preventive Medicine, Louisiana State Department of Health, New Orleans.

With few exceptions, each present household member was tuberculin tested. An intradermal tuberculin test was done, using a preparation of PPD; except in two households, the same preparation and lot num-

[3] The word tuberculosis was not used in our request for consent to study the household. On the other hand, certain of the families did agree to cooperate after they learned that each member would have a chest X ray, stating that they were glad of an opportunity to be X-rayed because they had suspected possible chest disease in themselves or some other member of the household. The acceptances or refusals were not limited to any particular economic or social group except for two colored households, both of which refused consent to be studied. No other colored families were approached.

ber was used in the entire study. Tests were read after 48 hours, and, with few exceptions, were made and read by one of us (B.J.O.).

A stool sample was obtained from each member and sent to the Division of Zoology, National Institute of Health, for study. Soil samples were collected from selected areas adjacent to the dwelling.

The investigation in Ross County is divided into two parts:

1. A study of the relationship of pulmonary calcification to exposure to tuberculosis.

2. A study of the relationship of other possible causes, chiefly ascariasis, to pulmonary calcification.

RESULTS

Twenty of the 44 households lived in the southeastern section of the county (Harrison school area), and 24 lived in the north-central area (Clarksburg school). The average size of the households was 9.1 persons, including all present and past members. A total of 101, or 25.1 percent of the individuals, had left the household alive prior to the investigation. In only 3 of the 44 households had more than 50 percent of the total members left prior to the time of the study. In 20 of the households between 25 and 50 percent of the members had left, and in the remaining 21 less than 25 percent of the members had left prior to the investigation. In the latter group it was interesting to note that of 98 persons in 15 households, only 7 had left the household before the study began.

It is seen from table 2 that the sexes are almost equally divided among the 279 present household members. The variations in the proportion of males and females in the various age groups are not considered significant owing to the small numbers involved. The number of males and females leaving the household alive is approximately the same, as is also the age at which they left the household.

TABLE 2.—*Age and sex distribution of all present and past members of households*

Age group	Present members			Past members						Grand total
				Living when left household			Deaths in household			
	Total	Male	Female	Total	Male	Female	Total	Male	Female	
Under 5	27	12	15	8	2	1	[1] 16	11	5	46
5–9	40	23	17	1	1	0	1	1	0	42
10–14	62	27	35	1	0	1	0	0	0	63
15–19	43	27	16	11	2	9	0	0	0	54
20–34	36	15	21	48	24	24	1	1	0	85
35–54	61	31	30	23	14	9	0	0	0	84
55 and over	10	9	1	14	7	7	4	2	2	28
Total	279	144	135	101	50	51	22	15	7	402

[1] Age group 6 months and under—total 12, 9 male, 3 female.

A total of 22 deaths occurred, 16, or 73 percent, in children under 4 years of age. Twelve were in infants 6 months of age or under, which represents 55 percent of all deaths in the households. None of the deaths were believed to have been due to tuberculosis. The causes were given as follows: 6 months and under—4 deaths from unknown cause (the ages at death were 1 day, 2 days, 1 month, and 4 months); pneumonia, 2; malnutrition, 3; pyloric stenosis, 1; cholera infantum, 1; and pertussis, 1; over 6 months—pyloric stenosis, 1; convulsions, 1; post operative, 1; diphtheria, 1; apoplexy, 2; asthma, 1; old age, 1; rheumatic fever, 1; auto accident, 1.

The age distribution among individuals dying from all causes in the households does not resemble the age distribution among persons dying from tuberculosis in the United States. The high proportion of infant deaths is not unusual.

X-ray examination of present members.—Information concerning the presence or absence of tuberculosis in the households under study was obtained by the X-ray examination of the present household members. The results are given in table 3.

TABLE 3.—*Summary of X-ray examinations of present household members*

	Number	Percent
Total members present at time of investigation	279	
Number X-rayed	256	91.7
Number not X-rayed	23	8.2
Poor films	3	1.1
Total number effectively X-rayed	253	90.7
Number effectively X-rayed showing calcified pulmonary lesion	125	49.4
Number effectively X-rayed not showing calcified pulmonary lesion	128	50.6
Total number of significant tuberculous lesions	0	0.0
Total number of other X-ray findings	8	3.2

From this table it is seen that 90.7 percent of the present household members were effectively X-rayed. There was no X-ray evidence of a significant tuberculous lesion in any of these persons. A total of 125, or 49.4 percent, had demonstrable pulmonary calcification. X-ray findings other than pulmonary calcification were present in 8 members, as follows: Irregular diaphragm, 1; interlobar pleural line, 1; irregular pleural cap, 1; pneumoconiosis, 1; cardiovascular lesion, 2; pneumonitis which had disappeared on recheck, 1; and cervical rib, 1.

The age distribution of the persons showing pulmonary calcification is given in table 4. It is seen from this table that over half of the individuals with such calcification were under 20 years of age.

Tuberculin tests.—The recent study by Furcolow et al. (*6*) has re-emphasized the close correlation between a positive reaction to tuberculin and contact with tuberculosis. These workers found that tests with 0.0001 milligram of PPD gave 95.6 percent positive reactions in

institutionalized individuals classified either as having active tuberculosis or as being in contact with active tuberculosis. The dose of PPD used in our study was one-tenth of the second strength dose (0.0005 milligram) or five times the dose used by Furcolow et al.

TABLE 4.—*Occurrence of pulmonary calcification, by age, in 253 household associates*

Age group	Total number X-rayed	Pulmonary calcification			
		Present		Absent	
		Number	Percent	Number	Percent
Under 10	63	9	14.3	54	85.7
10–19	97	59	60.8	38	39.2
20–34	28	16	57.1	12	42.9
35–54	57	35	61.4	22	38.6
55 and over	8	6	75.0	2	25.0
Total	253	125	49.4	128	50.6

A total of 235, or 84.2 percent of the present household members effectively X-rayed, were tuberculin tested.

The results of the tuberculin testing revealed that 41, or 17.4 percent of the individuals, were tuberculin-positive, and 194, or 82.6 percent, were tuberculin-negative. The low rate of positive reactions in individuals of all ages in this group is most easily explained by the absence of contact with active tuberculosis in the households under study, as indicated by the results of the X-ray examinations.

The relationship of the tuberculin reaction to the occurrence of pulmonary calcification is shown in table 5.

TABLE 5.—*Relationship of tuberculin reaction to pulmonary calcification, by age groups, in 235 individuals who were tuberculin tested and X-rayed* [1]

	(A) Under 20 years			(B) 20 years and over			(C) All ages		
	Pulmonary calcification			Pulmonary calcification			Pulmonary calcification		
	Present	Absent	Total	Present	Absent	Total	Present	Absent	Total
Tuberculin reaction:									
Positive	6	0	6	23	12	35	29	12	41
Negative	56	86	142	30	22	52	86	108	194
Total	62	86	148	53	34	87	115	120	235

[1] Since no implication is intended that calcification in any household associate is "secondary" to that found in the index person, index persons are included in the above and in subsequent tabulations.

Age group under 20.—As shown in table 5 (A), 160 household associates in this age group were X-rayed, 148 of whom were tuberculin tested. Among the 12 individuals not tuberculin tested, 6 had pulmonary calcification and 6 had no demonstrable pulmonary calci-

fication. Of the total number X-rayed and tuberculin tested, with pulmonary calcification, 6, or 9.7 percent, were tuberculin-positive and 56, or 90.3 percent, were tuberculin-negative. The table shows that 86 individuals without pulmonary calcification were 100 percent tuberculin-negative.

The association of a positive reaction to tuberculin and pulmonary calcification is found to be statistically significant. However, if it is assumed that a positive tuberculin reaction is evidence of a possible tuberculous origin of the pulmonary calcification found in 6 individuals, there is no explanation for the occurrence of pulmonary calcification in 56 individuals who were tuberculin-negative.

Age group 20 and over.—Ninety-three household associates in this age group were X-rayed, of whom 87 were tuberculin tested, as shown in table 5 (B). Among the individuals not tuberculin tested, 4 had pulmonary calcification and 2 had no demonstrable pulmonary calcification. It is seen from this table that 53 of the individuals tuberculin tested had pulmonary calcification, and of this number 23, or 43.4 percent, were tuberculin-positive. Of the 34 individuals of this age group without pulmonary calcification 12, or 35.3 percent, were tuberculin-positive. These data show no statistically significant association between a positive tuberculin reaction and the occurrence of pulmonary calcification.

Table 5 (C) gives the combined data for the two age groups discussed. There is a statistically significant association of pulmonary calcification with tuberculin positiveness for the entire group.

It is observed that 90.3 percent of the individuals under 20 years of age showing pulmonary calcification were tuberculin-negative as compared with 56.6 percent of those 20 and over. These data suggest that the individuals under 20 with pulmonary calcification had never been tuberculin-positive, and that with an increase in age half of them become tuberculin-positive. It does not seem logical or necessary to assume that the individuals under 20 years of age either had lost an earlier allergy to tuberculin or were anergic.

From the above data and under the conditions of this study a significant statistical correlation between a positive tuberculin reaction and pulmonary calcification has been demonstrated in the study group. However, applying the tuberculin test as a measure of tuberculous infection, 90.3 percent of the pulmonary calcification in the age group under 20, 56.6 percent in the group 20 years of age and over, and 74.8 percent in the entire group could not be considered as of tuberculous etiology by this criterion.

Household history of tuberculosis.—History of tuberculosis was obtained of all members since the establishment of the households involved. Table 6 shows the relationship of a household history of tuberculosis to the occurrence of pulmonary calcification. It is seen

from this table that only 12, or 4.7 percent, of the 253 household associates studied had a household history of tuberculosis. These individuals were members of only 2 households whose history is as follows:

R–32: The head of the household, present age 45 years, was diagnosed as having tuberculosis in 1918 while in France. In 1920 he was hospitalized for 8 months and was discharged as an arrested case. He married and established the present household in February 1919. The first child, born in December 1919, died of rheumatic heart disease in March 1937. The second child was born in 1922, 2 years after the diagnosis of arrested tuberculosis in the father. Three more children were born later.

At the time of this study the head of the household was X-rayed twice, both films showing no evidence of parenchymal pathology indicative of present or past tuberculosis. The only finding was that of calcified hilar glands. Since his hospitalization in 1920 he has been doing hard manual work and has been in good health. His tuberculin reaction is 1 plus. His wife, present age 44, has a 2 plus tuberculin, X-ray findings of calcification of hilar glands, and one parenchymal calcification. The four surviving children born since 1920 are all tuberculin-negative and only one of the three has a pulmonary calcification. This child, a girl aged 18, born in 1922, has multiple parenchymal calcification and also hilar calcification.

TABLE 6.—*Relationship of household history of tuberculosis to pulmonary calcification in 253 household associates who were X-rayed*

Household history of tuberculosis	Pulmonary calcification		
	Present	Absent	Total
Positive	5	7	12
Negative	120	121	241
Total	125	128	253

The results of our study of the head of this household make us doubt whether this individual ever had tuberculosis. However, if the head of the household had not been available for study, and such a history had been obtained, this would have been considered a case of tuberculosis, i. e., a source of household exposure. Therefore, in these data, it is classified as household exposure in spite of our serious doubts.

R–37: The sister-in-law of the head of the house lived in this family only during the month of January 1928, at which time she was ill with tuberculosis. She left the household in February 1928 and died of the disease in July 1928. This household was established in March 1919. There were four children, born during 1920, 1923, 1925, and 1929. Therefore, three of the children and the husband and wife were considered to have been exposed during the month of January 1928. X-rays during the study of these five individuals revealed that the head of the household, aged 41, had a parenchymal calcification. The wife (sister of the case), aged 38, was negative on X-ray. Three of the four children were negative on X-ray and the remaining child, aged 15, had a hilar calcification. Four of the six members were tuberculin tested and only the head of the house was tuberculin-positive. The children born in 1920 and 1929 were not tested.

There is no question that this family was exposed to manifest tuberculosis for 1 month in 1928 (12 years prior to study). It is interesting to note that only one

of the five exposed members was tuberculin-positive and that only two of the exposed group had positive X-ray findings of calcification. The child born 1 year after the household exposure had a negative X-ray.

Assuming that both families were exposed to tuberculosis, it was found that of a total of 12 present members in both families, 6, or 50 percent, showed calcification; 10 of 12 exposed members were tuberculin tested, only 3 of whom were tuberculin-positive. The incidence of calcification in these 2 families is equal to that found in the study group as a whole.

The low incidence of household exposure to tuberculosis, as determined by the household histories, is supported by the absence of significant tuberculous lesions, demonstrable by X-ray, in household associates present at the time of study and further by the low rate of positive reactions to tuberculin for the study group as previously described. No information was obtained from the household histories to suggest that the high prevalence of pulmonary calcification could be explained by a prior case of tuberculosis in the household.

Family history of tuberculosis.—The occurrence of tuberculosis in any member of a family was specifically investigated. The data obtained are given in table 7.

TABLE 7.—*Age distribution of all grandparents, uncles, and aunts of index cases in 43 rural families in Ross County and history of tuberculosis among them at last observation* [1]

Age group	Living		Dead		Age group	Living		Dead	
	Living	Cases of tuberculosis	All deaths	Deaths from tuberculosis		Living	Cases of tuberculosis	All deaths	Deaths from tuberculosis
Unknown	16	1	27	9	35-44	128	0	17	2
Under 1	1	0	51	1	45-54	93	1	17	2
1-4	3	0	18	0	55-59	37	1	6	1
5-9	4	0	4	0	60-69	61	0	32	3
10-14	5	1	6	1	70 and over	27	0	42	1
15-19	21	0	10	0					
20-24	33	0	11	1	All ages	531	4	256	25
25-34	102	0	15	4					

[1] No history was obtained for 1 family, and for another the husband's family history was unobtainable while the wife's is included.

Table 8 gives detailed data on the cases of and deaths from tuberculosis as given in the family history and the extent of contact of present household members to this source of infection.

TABLE 8.—*Relationship of a case of tuberculosis in an uncle, aunt, or grandparent of the index case to the present household*

Household No.	Familial relationship to household members	Age and date of case or death [1]	Date present household established	Present household member with contact: Present age	Present household member with contact: Age at contact	Tuberculin test	Result of X-ray	Total number in household	Number X-rayed	Number with pulmonary calcification
R-1	Wife's father	D-56, 1921	July 25, 1930	32½	14	Negative	Calcification	8	6	4
R-8	Husband's father	D-37, 1905	Aug. 23, 1921	43½	8	Positive	Negative	16	13	4
R-9	Wife's mother	C-59, 1902	Nov. 10, 1927	29	Before birth	do	Calcification	11	9	4
	Husband's grandmother	D-81, 1921	do	38	19	Negative	do	11	9	4
R-12	Wife's mother	D-31, 1914	Oct. 17, 1925	31½	5	Positive	do	14	8	5
R-13	Husband's mother	D-25, 1898	May 20, 1917	45½	3	Negative	do	14	10	6
R-18	Wife's father	D-64, 1914	Mar. 30, 1911	52	25	Positive	Negative	16	6	1
R-26	Wife's mother	D-28, 1911	Apr. 16, 1924	35½	6	do	do	7	5	1
R-31	Wife's father	C-50, 1936	Apr. 7, 1928	29	25	Negative	Calcification, pleural cap.	4	3	3
R-32	Husband's uncle	D-11, 1918	Feb. 28, 1919	45	23	Positive	Calcification	8	6	3
R-37	Wife's sister	D-20, 1929	Mar. 5, 1919	37½	27	Negative	Negative	7	6	3
	Wife's brother [2]	C-14, 1926								
R-41	Wife's mother	D-28, 1898	Jan. 1, 1919	45	3	do	Calcification	7	6	3
R-40	Wife's father	D-?, 1896	Nov. 2, 1912	50	6	do	Negative	13	6	1
R-27	Husband's father	D-60?, 1910	May 17, 1916	60	36	Positive	Calcification	10	7	5
	3 sisters, 1 brother [3]									
R-29	Wife's mother	D-45, 1893	Jan. 2, 1913	51	At intervals from birth to 49 years.	Positive	Calcification	8	5	4
	Father	D-45, 1889								
	4 brothers	D-Young adults, prior to 1889.								
	1 sister	D-38, 1918								
	do	D-64, 1938								
	do	C-When young.								

[1] C indicates case; D, death.
[2] No known contact with household.
[3] Died as young adults prior to 1916.

NOTES.—
R-9. Wife's mother: Living and well at present (1940).
R-18. Wife's father: Has never lived in present household. Household member with pulmonary calcification, child born 1931.
R-31. Wife's father: Father suspected of having tuberculosis in 1936. Diagnosis not confirmed by X-ray. Living and well now. Only contact with present household is occasional visits.
R-32. Husband's uncle: Tuberculosis of hip given as cause of death.
R-37. Wife's sister: Only contact is occasional visit.
R-37. Wife's brother: In the tuberculosis sanatorium in 1926. Living and well now. No contact with present household.
R-41. Wife's mother: Mother died in 1898 from tuberculosis. An infant daughter also died in 1898 from tuberculosis.
R-27. Husband's father, 3 sisters, and 1 brother all died of tuberculosis prior to the date of establishment of the present household.

From table 8 it is apparent that the contact between a case of tuberculosis in the family of either parent of the index case and the members of the present household is remote. Of the households listed as having a positive family history, it is seen that only four were established at a time when a case of tuberculosis existed in some member of the family other than a member of the present household. In three of these households, the contact between the present household members and the familial case was remote. The remaining family (R–29) had a history of five deaths from tuberculosis and one case on the mother's side of the family. Three of the deaths occurred from 20 to 24 years prior to the establishment of the present household, and one occurred 5 years and one 25 years after the establishment of the household. The case of tuberculosis in this family occurred at an early unspecified age in an individual who later died at the age of 65 from heart disease. The authors doubt the authenticity of this case. The only contact between the present household and the family cases was "visiting" the cases prior to death. This must be considered definite though extra-household contact. It has not resulted in any manifest tuberculosis in the household members as evidenced by X-rays of five of a total of eight members. Four of the five members had pulmonary calcification. Results of tuberculin tests on these five persons revealed that the mother had a 1 plus tuberculin reaction. The other four persons, including the father, were tuberculin-negative. If the pulmonary calcifications found in this family were a result of the contact with tuberculosis, it would seem strange that more members of the family were not tuberculin-positive. It is doubtful whether the loss of allergy to tuberculin would account for their negative reaction when their respective ages are considered, namely, 51, 22, 16, and 14 years. The mother, the household member with the most contact, had a parenchymal calcification on X-ray. It seems probable that contact with familial tuberculosis could explain the finding of calcification only in the mother, who was tuberculin-positive.

In the 14 households with a family history of tuberculosis, a minimum of 15 members of the present household had had contact with the familial case. Among this group 7 were tuberculin-negative, 5 of whom had pulmonary calcification; 2 had negative X-rays. Among these 15 persons the only evidence found on X-ray that might be considered evidence of tuberculosis, other than calcification, was a "pleural cap" occurring in an individual who was tuberculin-negative and who also had a pulmonary calcification.

Table 9 summarizes the relationship of a family history of tuberculosis to the occurrence of pulmonary calcification. It is seen from this table that a positive family history of tuberculosis was obtained in 45, or 36 percent, of 125 individuals with pulmonary calcification. This is not a statistically significant correlation.

TABLE 9.—*Relationship of a family history of tuberculosis to pulmonary calcification in 253 household associates*

Family history of tuberculosis	Pulmonary calcification		
	Present	Absent	Total
Positive	45	56	101
Negative	80	72	152
Total	125	128	253

OTHER ILLNESSES STUDIED IN THE HOUSEHOLD MEMBERS

Specific inquiry was made in all households as to the occurrence of pertussis, pneumonia, and diarrhea in any of the members. Table 10 summarizes the occurrence of these diseases in the 253 household associates who were effectively X-rayed. It is seen that these diseases have no significant relation to the occurrence of pulmonary calcification.

TABLE 10.—*Relationship of pertussis, pneumonia, and diarrhea to pulmonary calcification in 253 household members effectively X-rayed*

X-ray finding	Total number X-rayed	Pertussis		Pneumonia		Diarrhea	
		Number positive	Percent positive	Number positive	Percent positive	Number positive	Percent positive
Calcification present	125	97	77.6	18	14.4	7	5.6
Calcification absent	128	80	62.5	18	14.1	9	7.0

Certain of the families were studied by Senior Mycologist C. W. Emmons (7) of the National Institute of Health for any evidence of the presence of *Coccidioides* as a possible factor in the etiology of the pulmonary calcification. His results were uniformly negative.

Throughout this study, an effort was made to discover any clinical syndrome or illness in the individuals with pulmonary calcification that might be considered related to the X-ray findings. This was uniformly unsuccessful, even in children where the X-ray evidence indicated that the process of calcification was incomplete. Consultation with family physicians revealed nothing in the way of past clinical illness which could be related to the presence of the pulmonary calcification. The children almost invariably presented the picture of robust health and, with the exception of illnesses listed, had a past history of good health.

DISCUSSION

It is evident from the data given that no significant relationship could be demonstrated between contact with known tuberculosis and the occurrence of pulmonary calcification in the groups studied.

Evidence of absence of household or familial exposure to tuberculosis was supported by the results of four different procedures used to measure tuberculous infection. These results were:

1. X-ray examination of present household members demonstrated the almost complete lack of any lesions which could be considered evidence of tuberculous infection other than pulmonary calcification.
2. Tuberculin tests of household associates resulted in the finding of a very low incidence of positive tuberculin reactions in the entire study group.
3. Detailed histories on the occurrence of tuberculosis in present or past household associates yielded little evidence to indicate that previous members of the household may have been a source of tuberculous infection.
4. Family histories revealed no significant relationship between the pulmonary calcification found in the study group and previous familial cases of tuberculosis.

These findings all indicate that pulmonary calcification as observed in this study has little demonstrable relationship to tuberculosis.

THE POSSIBLE RELATIONSHIP OF *Ascaris* TO PULMONARY CALCIFICATION

Our interest in the possible role of parasites in the production of pulmonary calcification was initiated by the rather close correlation between the distribution of such calcification and the areas of high incidence of *Ascaris lumbricoides* in man. Although available data are limited in nature and there are exceptions to the rule, in general the distribution of pulmonary calcification in the southeastern United States corresponds closely to the area of high *Ascaris* incidence in the Appalachian Plateau and its foothills, the area defined by Otto and Cort (*8*) as the endemic center of *Ascaris*.

It is a fact well known to parasitologists that the death of adult worms and the arrestment of parasite larvae in parenchymatous tissues are frequently followed by the production of a granulomatous type of lesion grossly and sometimes microscopically indistinguishable from the lesions of this type which characterize certain chronic bacterial diseases. For instance, the nodular lesions produced in the lungs of sheep, goats, and some other ruminants by the lungworm, *Muellerius capillaris*, are of the typical granulomatous type and may eventually calcify, at which stage they are easily detectable on X-ray examination of living animals. Similarly, the nodules which occur so frequently in the lungs of swine and which so closely resemble the lesions of tuberculosis are due to the lungworm, *Metastrongylus elongatus*, as pointed out by Day, Bengston, and Raffensperger (*9*). *Capillaria hepatica*, a parasite encountered in the liver of certain rodents and reported at least once from man, commonly is surrounded by a granu-

lomatous reaction in which calcium is rather early deposited. Otto and von Brand (*10*) have shown that such calcification can be materially hastened by the injection into infected animals of parathormone.

Many workers have observed that the larvae of *Ascaris lumbricoides* may become entrapped in the course of their migration through the body of experimental animals and that dead larvae may be found in both the liver and lungs of these animals. One of us (*11*) has frequently noted worm nodules in the lungs, liver, and kidneys of dogs subjected to repeated experimental infections with the dog ascarid, *Toxocara canis*, some of these nodules being caseo-calcareous in nature and containing larvae identified as those of *T. canis*. Such nodules were encountered much more frequently in dogs on a normal diet than in litter mates on a vitamin-A deficient diet. The latter diet apparently lowers the resistance of the animal so that the larvae complete their migration in such cases instead of being retained in the tissues. During recent years, a considerable bulk of evidence has accumulated to indicate that animals acquire a certain amount of resistance as a result of some parasitic infections and that when such animals are exposed to subsequent infections migrating larvae are held in the tissues and are unable to pursue their normal path of migration. Some of the mechanisms of this arrestment have even been elucidated.

Soon after the discovery of the life cycle of *A. lumbricoides* by Stewart (*12*), Ransom (*13*) pointed out the acute manifestations connected with the migration of *Ascaris* larvae through the lungs of susceptible animals and noted that the problem should be carefully investigated in human infections. Since that time various studies have been made to this end.

Scott (*14*) reported on the X-ray examination of 14 cases of *Ascaris* infection. He stated that there was uniform thickening of the hilar shadows but no evidence of definite calcification in the hilum or parenchyma. He concluded that the X-ray findings were similar to those found in any acute respiratory infection.

Wampler and Sutton (*15*) studied a total of 99 individuals repeatedly exposed to *Ascaris* infection and conducted extensive clinical and roentgenographic observations on 9 children from the group. Although no positive evidence was obtained, these authors concluded that some of the bronchitis found may have been due to migrating *Ascaris* larvae.

Several authors have associated *Ascaris* with Löffler's syndrome. Wild and Loertscher (*16*) described two cases of transitory lung infiltration in children infected with *A. lumbricoides* and considered the shadows in the lung fields to be due to migrating larvae of this parasite. Müller (*17*) discussed several similar cases of transitory lung infiltration associated with eosinophilia. He regarded *Ascaris* as the etiolog-

ical agent in these cases and recognized the condition as a definite pathological entity in man.

Keller, Hillstrom, and Gass (*18*) made an X-ray study of the lungs of 80 children with *Ascaris* and 40 children free of *Ascaris* at the time of observation. Children in both groups were negative to the tuberculin test. The studies showed that the widening in the hilar areas, with increase in the bronchovascular markings, was more pronounced in the *Ascaris*-positive children. The authors considered that this condition was due possibly to the repeated migration of larvae of this parasite through the lungs. No pulmonary calcification was encountered in the children positive for *Ascaris* but pulmonary calcification was noted in 8 of the *Ascaris*-negative children, a finding attributed to healed tubercular lesions.

METHODS OF COLLECTION AND EXAMINATION OF SAMPLES FOR PARASITOLOGICAL STUDY

Stool samples.—One-ounce tin containers were distributed to each present member of the households for the collection of fecal samples. The name of each individual and the date of collection of the sample were written on the container and all containers were sent to the laboratory by first-class mail to insure speedy transit and prompt delivery. At the laboratory the containers were kept in an icebox until the samples were examined. For examination, approximately 1 gram of unstrained feces was mixed with tap water in a 50 cc. centrifuge tube, shaken vigorously, and centrifuged at 1,000 revolutions per minute for 2 minutes. The supernatant fluid was poured off, zinc sulfate (specific gravity 1.180, as recommended by Faust et al. (*19*)) was added, the mixture was again shaken vigorously and centrifuged at approximately 2,400 revolutions per minute for 2 minutes. Approximately 0.2 cc. of the top fluid was pipetted onto a slide and examined under the microscope for helminth ova and protozoan cysts. Three slide examinations of each sample were made. No attempt was made to determine in our positive cases the intensity of helminth infection by the dilution egg counting method, partly because of the small size of the fecal sample in most instances and partly because our positive helminth findings were too few to have much significance.

Soil samples.—Soil samples were collected in half-pint cartons, labeled as to location and date of collection, and mailed to the laboratory. The samples were taken from the vicinity of each home in places where human or animal pollution of the soil was seen or suspected. Particular attention was paid to the areas within the fenced-in yard surrounding the homes, in the gardens, and in the play areas of the children, whenever there was evidence of drainage toward these areas from nearby hog lots or pens. A diagram of

drainage for each household area was made at the time of collection of the samples.

In the examination of the soil samples for ova of parasites, the isolation technique described by Spindler (*20*) was used. The sample was thoroughly crushed and mixed, a 10-gram portion was placed in a 50 cc. centrifuge tube, treated for 30 to 40 minutes with 10 cc. of 30 percent antiformin solution, and frequently stirred. The tube was then filled with sodium dichromate (specific gravity 1.35), well shaken, and centrifuged at 1,000 revolutions per minute for 2 minutes. Approximately 0.2 cc. of the top fluid was pipetted onto a slide and examined under the microscope. Three slide examinations of each of the 10-gram portions were made. The different stages of development of the eggs were recorded. The small amount of material examined in each sample almost certainly resulted in failure to pick up very light infections.

RESULTS OF PARASITOLOGICAL EXAMINATIONS

Stool samples.—A total of 253 persons was included in the survey. Of this number 18 failed to submit a stool sample. The positive helminth findings for the 235 individuals who submitted stools were as follows: *Ascaris lumbricoides* 5, or 2 percent; *Trichuris trichiura* 6, or 3 percent; *Enterobius vermicularis* 4, or 2 percent; hookworm 2, or 1 percent; *Strongyloides stercoralis* 2, or 1 percent; and *Hymenolepis nana* 10, or 4 percent.

All of the worm infestations were single with the exception of one case, that of a 15-year old girl who harbored both *Trichuris trichiura* and *Hymenolepis nana*.

The 5 *Ascaris* cases occurred in 2 households, 4 cases in a family of 5 members, and 1 in a family of 7 members. Of the 253 persons included in the study, 31 had a past history of known *Ascaris* infection.

The positive findings of protozoan cysts for the 235 persons examined were as follows: *Endamoeba coli* 122, or 52 percent; *Endamoeba histolytica* 27, or 11 percent; *Chilomastix mesnili* 18, or 8 percent; *Iodamoeba butschlii* 16, or 7 percent; *Giardia lamblia* 11, or 5 percent; and *Endolimax nana* 11, or 5 percent. Some of these infections were mixed.

The relatively high percentage of individuals harboring cysts of *Endamoeba histolytica* is rather striking in view of the fact that none had any clinical symptoms. Only 16 individuals of the 253 included in the study gave a past history of diarrhea.

The distribution of parasitic infections among individuals, with and without pulmonary calcification, arranged according to age groups, is shown in table 11.

Table 11.—*Incidence of parasitic infections and exposure to swine Ascaris in persons (with and without pulmonary calcification) arranged according to age groups*

Age group	Parasitic infections as indicated by stool examinations															Past history of human *Ascaris* infection		Potential exposure to swine *Ascaris* as indicated by—						Total persons
	No sample	*Ascaris lumbricoides* (ova)		*Trichuris trichiura* (ova)		Other worms (ova)		*Endamoeba coli* (cysts)		*Endamoeba histolytica* (cysts)		Other protozoa (cysts)		Worm ova and protozoan cysts				*Ascaris* ova in soil		Hogs on farm		Drainage from hog lots		
		+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	
With pulmonary calcification																								
Under 5	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1
5–9	0	0	8	1	7	0	8	3	5	0	8	1	7	1	7	1	7	5	3	8	0	1	7	8
10–14	1	1	32	0	33	4	29	17	16	4	29	4	29	4	29	3	31	17	17	25	9	11	23	34
15–19	3	0	22	0	22	1	21	13	9	5	17	7	15	1	21	4	21	14	11	22	3	9	16	25
20–34	1	0	15	0	15	0	15	7	8	2	13	4	11	0	15	4	12	9	7	15	1	8	8	16
35–54	1	0	34	0	34	1	33	21	13	4	30	6	28	1	33	6	29	17	18	27	8	13	22	35
55 and over	1	0	5	1	4	0	5	3	2	0	5	1	4	1	4	1	5	1	5	5	1	1	5	6
Total	7	1	117	2	116	6	112	64	54	15	103	23	95	8	110	19	106	64	61	103	22	44	81	125
Without pulmonary calcification																								
Under 5	5	1	16	0	17	1	16	7	10	1	16	4	13	1	16	2	20	8	14	17	5	10	12	22
5–9	5	2	25	0	27	5	22	13	14	3	24	6	21	3	24	2	30	16	16	25	7	12	20	32
10–14	0	0	28	2	26	3	25	16	12	2	26	5	23	4	24	1	27	13	15	25	3	10	18	28
15–19	1	0	9	1	8	2	7	4	5	1	8	2	7	1	8	0	10	3	7	8	2	2	8	10
20–34	0	1	11	0	12	0	12	6	6	1	11	1	11	0	12	3	9	3	9	11	1	3	9	12
35–54	0	0	22	1	21	0	22	11	11	4	18	3	19	0	22	4	18	11	11	18	4	6	16	22
55 and over	0	0	2	0	2	1	1	1	1	0	2	0	2	0	2	0	2	1	1	2	0	0	2	2
Total	11	4	113	4	113	12	105	58	59	12	105	21	96	9	108	12	116	55	73	106	22	43	85	128
Grand total	18	5	230	6	229	18	217	122	113	27	208	44	191	17	218	31	222	119	134	209	44	87	166	253

Soil samples.—Soil samples were collected from all but 2 of the 44 households included in this study and these 2 were omitted because of the short period of residence of the families on these farms. A total of 204 soil samples was collected from the 42 households, an average of nearly 5 per household. Of this total, 28, or 14 percent, were found positive for ova of *Ascaris lumbricoides*, but these positive samples came from 20, or 48 percent, of the households. The majority of the eggs found were in either the embryonated or the developing stage. The positive soil samples were from places where human contact with the soil was most likely, for instance, in the children's play area, around the back door or porch, around the front of the house, and on the floor of or near the entrance to the privy.

There were only 2 positive soil samples in which the *Ascaris* eggs were undoubtedly of human origin. Both of these samples were from households with members found positive for *Ascaris lumbricoides* on stool examination. In the household with 1 individual positive for *Ascaris* infection, *Ascaris* eggs, mostly embryonated, were found in the soil taken from the floor of an old garage in which numerous soiled papers were seen, and we consider them beyond doubt human *Ascaris*. The only other positive soil sample from this farm was collected along the side of the barn near the entrance to the section housing hogs and the latter are considered the source of the *Ascaris* ova. In the other household with 4 members positive for *Ascaris* infection, 3 soil samples were found positive. In only 1, collected from the floor of the privy near stools on floor, were the eggs, most of them dead, undoubtedly from a human source. There was no evidence of human soil pollution anywhere in the yard or in the play area where 44 hogs maintained on this farm were allowed to roam at will. Consequently, the eggs found in the soil from around the back steps and in the play area where both pigs and children's toys were observed are considered of suilline origin.

It is probable that the *Ascaris* eggs in the soil samples from the remaining 18 positive households came from hogs. Only 1 farm was without hogs at the time the samples were collected. The hogs had been sold the previous fall but the family had always had hogs and when the children were young they played with hogs. A 19-year-old boy in this family had pulmonary calcification. On 8 of the farms there were anywhere from 50 to 300 hogs; on 1 there were between 25 and 50; and on the remaining farms there were 12 hogs or less.

The number of hogs on a farm does not necessarily determine the intensity of exposure to hog parasites. It was often observed that a family with one or two hogs would keep them in the yard around the house or in a pen very close to the house. This must have resulted in certain instances in a very heavy exposure of the household members to hog parasites.

Other helminth eggs were found in the soil samples, as follows: *Ascaridia galli* in 48; degenerated ascarid eggs in 7; *Parascaris equorum* in 1; *Toxocara* in 22; *Toxascaris* in 1; *Capillaria* spp. in 11; *Trichuris* spp. in 16; trichurid-like[4] eggs in 35; *Hymenolepis diminuta* in 1.

DISCUSSION OF PARASITOLOGICAL OBSERVATIONS

From the foregoing data and table 11 it is apparent that the incidence of parasites both in human beings and in soil samples near homes is so similar for the groups with and without pulmonary calcification that no significant conclusion can be drawn. The marked difference in age distribution between these two groups is striking. Only 7 percent of the group with pulmonary calcification, were under 10 years of age and 34 percent were under 14, as compared to 42 and 64 percent, respectively, in the group without pulmonary calcification. If *Ascaris* is involved in the development of pulmonary calcification, the lower incidence of such calcification in young children, as shown by our findings, may be explained by the assumption that this calcification develops only after a considerable lapse of time following initial infection, or after repeated exposure.

While no information was obtainable from State or local health authorities, it was assumed that there would be little or no infection with human *Ascaris* in Ross County, Ohio, and the results of our study support this assumption. The incidence of swine *Ascaris* was not known, but the parasite may be assumed to be endemic throughout the State. Our data show that *Ascaris* infection in hogs is prevalent in Ross County, as might be expected, that *Ascaris* eggs are more or less widespread in the soil, and that there was ample opportunity for human infection from contact with contaminated soil.

It is difficult to evaluate the exact role of swine *Ascaris* in human lung infections. Even though the parasite does not complete its development in man, there is evidence that the larvae penetrate to the lung during the course of their migration and that very definite lung symptoms may occur as a result of this invasion. There is no doubt that many of these larvae may be trapped in the lungs.

The classical experiment of Koino (*21*) offers direct evidence concerning the pathogenicity of the migrating larvae of the swine ascarid in man. Koino himself swallowed 2,000 infective ova of the human *Ascaris* and experimentally infected his brother with 500 ova of swine *Ascaris*. Both individuals developed the same symptoms of bronchopneumonia, including fever, difficulty in breathing, pain in the chest, and pulmonary infiltration, except that the author himself suffered more severely because of the larger number of ova swallowed. Koino recovered many larvae from his own sputum and 50 days after in-

[4] It was not possible to make a generic determination of these eggs.

fection 667 immature ascarids were passed following anthelmintic treatment. In the case of the brother, no larvae were found in the sputum and no worms were recovered from the intestine.

At the time the present investigation was started it was not anticipated that results of work based on epidemiological studies alone would have a decisive bearing on delineating the role of *Ascaris* in pulmonary calcification. In the first place, it is not possible in a study of this sort to measure the extent of exposure, to delimit the period of *Ascaris* intake, to gauge the degree of pulmonary damage, or even to guess as to the length of time needed for the appearance of calcification in any lesions which might possibly be due to parasite larvae. It is considered that the results of the present study neither prove nor disprove the hypothesis upon which the work was predicated. Undoubtedly additional field observations are in order, supplemented by suitable experimental work on the effects of long-continued exposure to *Ascaris* larvae. Experiments to date certainly throw little light on the problem because they have been concerned almost entirely with the acute manifestations of pulmonary damage. However, until additional evidence is available, it is believed that the parasite in question should not be ruled out as a possible etiological agent in pulmonary calcification.

CONCLUSIONS

1. A high incidence of pulmonary calcification which could not be related to tuberculosis has been observed in household associates in a group of families in Ross County, Ohio.
2. This pulmonary calcification appears to result from an as yet unrecognized disease of very common occurrence which produces pulmonary lesions closely simulating the X-ray picture of primary tuberculosis.
3. The finding of pulmonary calcification, particularly in tuberculin-negative individuals, should not be assumed to be evidence of infection with tuberculosis.
4. On the basis of the data furnished by this epidemiological study, we were unable either to prove or disprove the possible role of *Ascaris* as a causative agent in pulmonary calcification.

ACKNOWLEDGMENTS

The authors wish to acknowledge gratefully the assistance received in various phases of this investigation from several individuals and groups. Dr. R. Markwith, State health officer, lent encouragement to the study and kindly detailed special nurse Miss F. Glenn to aid in the work in Ross County; Dr. R. Bower, health commissioner of Ross County, manifested a keen personal interest and freely gave his

cooperation at all times; Mr. H. Boecher, sanitation officer, and Miss L. Thornton, tuberculosis nurse, of Ross County, also cooperated. The Tuberculosis Study Group, State of Tennessee, and particularly Dr. R. S. Gass and Dr. W. Murphy, were consulted in regard to certain techniques used.

REFERENCES

(*1*) Gass, R. S., Gauld, R. L., Harrison, E. F., Stewart, H. C., and Williams, W. C.: Tuberculosis studies in Tennessee. Roentgenological evidence of tuberculosis infection in relation to tuberculin sensitivity in school children. Am. Rev. Tuberc., **38**: 441–447 (October 1938).
(*2*) Lumsden, L. L., and Dearing, W. P.: Epidemiological studies of tuberculosis. Am. J. Pub. Health, **30**: 219–228 (March 1940).
(*3*) Dearing, W. P., Olson, B. J., Self, L. R. W., and Baggett, M. W.: A comparison of household attack rates in regions with high and low mortality. (In press.)
(*4*) Keeler, F. R.: The geology of Ross County. (Unpublished.)
(*5*) Frost, W. H.: Risk of persons in familial contact with pulmonary tuberculosis. Am. J. Pub. Health, **23**: 426–432 (May 1933).
(*6*) Furcolow, M. L., Hewell, B., Nelson, W. E., and Palmer, C. E.: Quantitative studies of the tuberculin reaction. I. Titration of tuberculin sensitivity and its relation to tuberculous infection. Pub. Health Rep., **56**: 1082–1100 (May 23, 1941).
(*7*) Emmons, C. W.: (Unpublished data).
(*8*) Otto, G. F., and Cort, W. W.: The distribution and epidemiology of human ascariasis in the United States. Am. J. Hyg., **19**: 657–712 (May 1934).
(*9*) Day, L. E., Bengston, J. S., and Raffensperger, H. B.: Parasitic nodules resembling tuberculosis in the lungs of swine. J. Am. Vet. Med. Assoc., **71**: 39–51 (April 1927).
(*10*) Otto, G. F., and von Brand, Th.: Natural and experimental calcification in *Capillaria hepatica* infection. Am. J. Hyg., **34**: (D) 13–17 (July 1941).
(*11*) Wright, W. H.: (Unpublished data).
(*12*) Stewart, F. H.: On the life-history of *Ascaris lumbricoides*. Brit. Med. J., **2**: 5–7, 753–754 (1916).
(*13*) Ransom, B. H.: A newly recognized cause of pulmonary disease—*Ascaris lumbricoides*. J. Am. Med. Assoc., **73**: 1210–1212 (Oct. 18, 1919).
(*14*) Scott, C. W.: Pulmonary findings in a clinical study of *Ascaris* infection in children. Virginia Med. Monthly, **57**: 34–37 (April 1930).
(*15*) Wampler, F. J., and Sutton, L. E., Jr.: A study of the lung involvement in human ascariasis. Virginia Med. Monthly, **59**: 65–72 (May 1932).
(*16*) Wild, O., and Loertscher, M.: Zur Aetiologie der flüchtigen Lungeninfiltrierungen. Schweiz. Med. Wchnsch., **64**: 829–830 (September 1934).
(*17*) Müller, R. W.: Über die flüchtigen eosinophilen Lungeninfiltrate zur Frage der Lungenentzündungen durch Spulwurmlarven. Beitr. Klin. Tuberk., **92**: 254–274 (1938).
(*18*) Keller, A. E., Hillstrom, H. T., and Gass, R. S.: The lungs of children with *Ascaris*. A roentgenologic study. J. Am. Med. Assoc., **99**: 1249–1251 (Oct. 8, 1932).
(*19*) Faust, E. C., D'Antoni, J. S., Odom, V., Miller, M. J., Peres, C., Sawitz, W., Thomen, L. F., Tobie, J., and Walker, J. H.: A critical study of clinical laboratory technics for the diagnosis of protozoan cysts and helminth eggs in feces. I. Preliminary communication. Am. J. Trop. Med., **18**: 169–183 (March 1938).
(*20*) Spindler, L. A.: On the use of a method for the isolation of *Ascaris* eggs from soil. Am. J. Hyg., **10**: 157–164 (July 1929).
(*21*) Koino, S.: Experimental infections on human body with ascarides. Japan Med. World, **2**: 317–320 (Nov. 15, 1922).

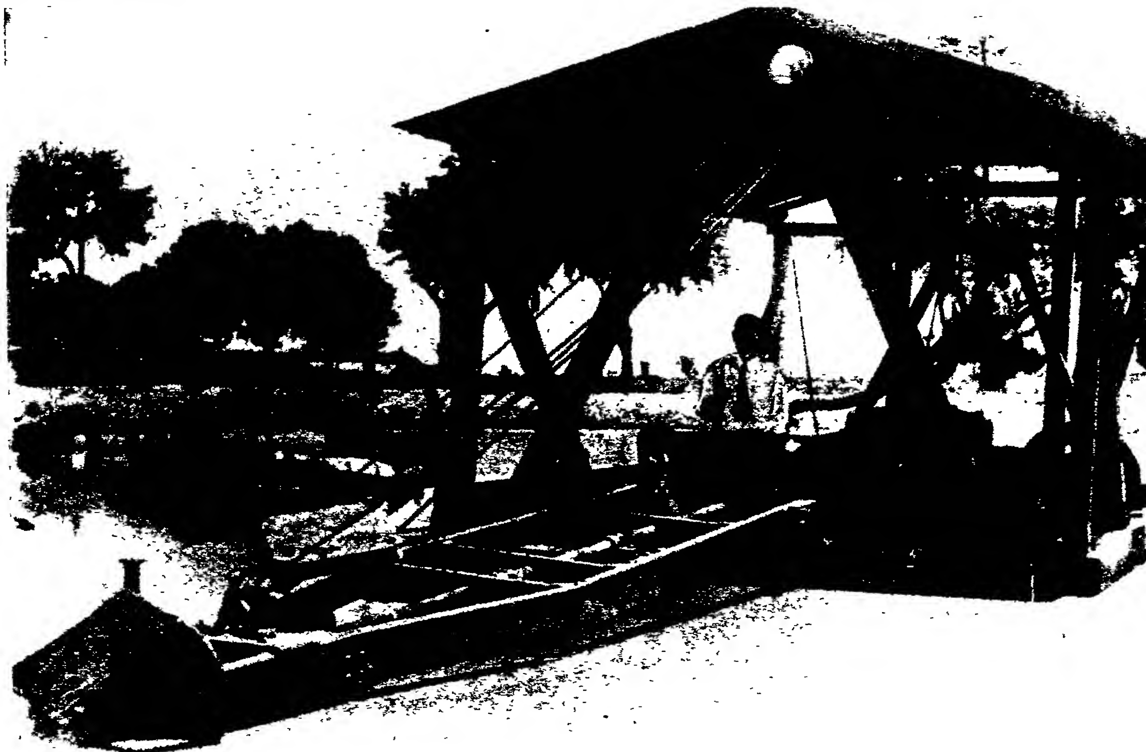


FIGURE 1.—Home-made hydraulic dredge.

DESCRIPTION OF HOME-MADE HYDRAULIC DREDGE EMPLOYED IN MALARIA CONTROL AT PERRY, FLORIDA

By A. C. Newman, *Assistant Engineer, Florida State Board of Health*

A shallow pond and a "boil" at the head of Spring Creek, both located within the town limits of Perry, Florida, were sources of prolific production of *Anopheles quadrimaculatus*. The pond was practically undrainable. It was considered desirable, therefore, to deepen both the pond and the "boil" and to steepen their banks, the "spoil" to be used to fill in shallow areas along the shore lines. To accomplish these aims a home-made hydraulic dredge was designed and constructed through the ingenuity of the county sanitary officer and two interested citizens.

The dredge cost slightly over $500, aside from the pump which cost $191.50 when new. This pump was originally purchased by the city for other purposes and was not used; it therefore entailed no cash outlay for this project. Much material from auto junk yards was used in the construction of the dredge, as may be seen from the drawing and photographs, and this was a factor in its low cost. Labor of construction amounted to $217.65, hardware $61.33, lumber $161.75, boom and cutter bar $75, and miscellaneous items $23. These items, totaling $538.73, constitute the cash outlay.

A used automobile engine, including the transmission, serves as the source of power. The pump (rated at 750 G. P. M., 16 feet head, 20 H. P.) is in line with and is driven by this engine. A belt from the pump drive shaft turns the main shaft from which, through gears, power is taken off to drive the cutter shaft. The spuds are operated by means of cables from drums which are driven by old automobile wheels equipped with discarded outer casings; these in turn are driven by friction from the main shaft. The front end anchorages are controlled in the same manner. The boom is an old truck frame cut down. It is controlled vertically by cables from a drum driven by a sprocket and chain power take-off from the forward shaft. "Spoil" is sucked into a 4-inch suction hose behind the cutter blades. The discharge line from the pump is floated ashore on barrels. The hand levers are merely 1½-inch by ¼-inch iron bars.[1]

Work with the dredge was first started at the "boil" at the head of Spring Creek, where approximately 700 cubic yards of excavation and hydraulic fill were handled at a cost of 23 cents per cubic yard. Next, the pond was conditioned by dredging in a circle approximately 200 feet in diameter. Thirty-five hundred cubic yards of fill were made at this site at a cost of 16 cents per cubic yard. The difference in unit cost of hydraulic fill at the "boil" and at the pond is explained by the fact that limestone rock was encountered in the dredging operations at the former location.

DEATHS DURING WEEK ENDED OCTOBER 18, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Oct. 18, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,599	7,549
Average for 3 prior years	7,813	
Total deaths, first 42 weeks of year	351,752	352,863
Deaths per 1,000 population, first 42 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	541	496
Average for 3 prior years	475	
Deaths under 1 year of age, first 42 weeks of year	22,089	21,064
Data from industrial insurance companies:		
Policies in force	64,546,105	64,784,337
Number of death claims	9,186	10,765
Death claims per 1,000 policies in force, annual rate	7.4	8.7
Death claims per 1,000 policies, first 42 weeks of year, annual rate	9.5	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED OCTOBER 25, 1941

Summary

The total number of cases of poliomyelitis decreased from 312 to 294 during the current week although slight increases were recorded for several States. The following-named 6 States reported 15 or more cases (last week's figures in parentheses): New York 57 (55); Tennessee 22 (17); Ohio 17 (14); Pennsylvania 16 (30); New Jersey 15 (12); and Minnesota 15 (11).

The incidence for the country as a whole is still above the 5-year (1936–40) median (197 cases), but has been continuously below the 1940 weekly figures since the latter part of August. The total cases reported to date this year, 7,885, is below the number reported for both 1940 (8,383 cases) and 1937 (8,853), the two years of highest incidence during the past 5 years.

The number of reported cases of influenza increased from 1,131 to 1,330, of which 543 cases were reported in Texas, 177 in Virginia, and 162 in South Carolina; these 3 States reported two-thirds of the total. The current incidence and the cumulative total to date are above the figures for the corresponding periods of each of the past 5 years. The sharp rise in the incidence of influenza last year occurred about the middle of November, when the disease began to assume epidemic proportions on the Pacific Coast.

Of the 9 communicable diseases included in the following table, only influenza, measles, and poliomyelitis were above the median expectancy during the current week. One-third of the cases of whooping cough were reported from the East North Central States, and almost one-half of the diphtheria cases were reported from the South Atlantic States.

Of 69 cases of endemic typhus fever, 27 occurred in Georgia, 16 in Texas, and 10 each in Alabama and Louisiana.

The death rate for the current week for 88 large cities in the United States is 11.0 per 1,000 population, as compared with 10.6 for the preceding week and 11.1 for the 3-year (1938–40) average for the corresponding week.

Telegraphic morbidity reports from State health officers for the week ended October 25, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940	
NEW ENG.												
Maine	0	1	2	------	1	------	62	71	14	2	0	0
New Hampshire	0	0	0	------	------	------	1	0	1	0	0	0
Vermont	4	0	0	------	------	------	1	6	6	0	0	0
Massachusetts	2	5	5	------	------	------	101	159	73	2	1	1
Rhode Island	0	0	0	------	------	------	9	0	3	0	0	0
Connecticut	0	1	1	------	------	1	21	3	8	0	0	0
MID. ATL.												
New York [1]	16	16	18	[1] 4	[1] 3	[1] 7	71	157	89	0	1	3
New Jersey	9	8	9	3	1	5	40	74	41	0	0	1
Pennsylvania	8	6	23	1	------	------	123	369	46	5	2	8
E. NO. CEN.												
Ohio	29	9	84	6	15	15	63	11	17	0	0	2
Indiana	17	8	28	29	9	10	1	16	11	0	3	3
Illinois	12	12	32	8	5	8	32	135	17	2	2	2
Michigan [3]	9	6	20	------	------	1	38	168	44	2	1	2
Wisconsin	2	1	3	18	25	25	53	131	33	1	0	1
W. NO. CEN.												
Minnesota	2	1	3	1	2	2	4	0	8	0	1	1
Iowa	2	9	9	------	4	1	28	55	5	1	0	0
Missouri	10	13	14	10	1	15	7	7	7	0	0	0
North Dakota	0	4	3	1	------	4	86	0	0	0	1	0
South Dakota	8	1	2	------	------	------	2	2	2	0	0	0
Nebraska	8	5	2	------	------	------	4	8	2	0	0	0
Kansas	3	6		1	7	6	18	6	6	1	0	0
SO. ATL.												
Delaware	2	0	0	------	------	------	0	1	1	0	0	0
Maryland [3]	7	5	11	4	2	6	11	2	5	3	1	1
Dist. of Col.	1	0	6	1	------	------	1	2	2	0	0	1
Virginia [2]	49	27	67	177	56	47	37	29	9	1	0	2
West Virginia	15	4	28	14	2	10	61	1	2	0	2	2
North Carolina [4]	125	85	142	------	3	3	115	6	51	3	0	2
South Carolina [2]	41	27	29	102	198	221	6	2	2	0	2	1
Georgia [2]	53	28	42	30	19	19	11	3	2	0	0	0
Florida	5	5	11	34	------	2	1	2	2	1	0	0
E. SO. CEN.												
Kentucky	11	20	37	------	------	5	11	51	35	2	2	2
Tennessee	24	16	43	8	19	19	13	16	2	3	2	2
Alabama [3]	44	31	40	21	24	33	27	3	2	1	1	2
Mississippi [2,3]	14	11	17	------	------	------	------	------	------	0	1	1
W. SO. CEN.												
Arkansas	[5] 14	12	24	[5] 27	35	24	13	0	4	0	0	0
Louisiana [3]	5	20	23	6	4	10	0	1	1	0	0	1
Oklahoma [4]	11	24	24	51	18	33	35	6	2	0	0	0
Texas [3]	82	47	89	548	217	189	17	17	8	0	0	1
MOUNTAIN												
Montana	2	2	1	------	16	12	5	7	34	0	0	0
Idaho	0	0	0	------	5	4	9	0	9	0	0	0
Wyoming	0	1	1	9	------	------	1	4	2	0	1	0
Colorado	9	7	9	28	6	6	61	16	16	0	1	1
New Mexico	0	0	2	------	------	1	6	25	24	0	0	0
Arizona	3	5	5	65	112	58	74	14	3	0	0	0
Utah [3]	0	1	1	1	12	2	6	1	8	0	0	0
Nevada	0	0	------	------	------	------	0	0	------	0	0	------
PACIFIC												
Washington	1	7	2	3	------	------	3	5	9	1	0	0
Oregon	12	1	3	18	7	15	18	9	9	0	1	1
California	16	23	24	40	28	17	128	73	55	1	2	2
Total	668	521	926	1,330	856	856	1,435	1,674	1,359	32	28	49
43 weeks	[5] 12,029	[5] 12,218	20,576	[5] 575,776	174,921	156,891	839,759	237,570	273,979	1,705	1,419	2,499

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 25, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940		Oct. 25, 1941	Oct. 26, 1940	
NEW ENG.												
Maine	0	0	0	6	14	10	0	0	0	0	1	2
New Hampshire	0	0	0	2	8	3	0	0	0	1	0	0
Vermont	1	0	0	5	12	11	0	0	0	0	1	1
Massachusetts	11	0	2	108	61	73	0	0	0	6	3	1
Rhode Island	0	0	0	4	3	3	0	0	0	0	1	1
Connecticut	6	2	2	21	7	30	0	0	0	1	5	3
MID. ATL.												
New York [2]	57	12	12	107	163	176	0	0	0	14	4	14
New Jersey	15	3	3	51	66	59	0	0	0	7	1	4
Pennsylvania	16	5	5	102	111	192	0	0	0	10	7	20
E. NO. CEN.												
Ohio	17	33	7	171	156	156	0	0	0	4	5	13
Indiana	5	14	4	51	47	101	0	1	1	0	1	3
Illinois	12	38	16	135	178	209	1	13	2	7	18	18
Michigan [3]	8	45	15	122	119	178	6	0	0	4	2	7
Wisconsin	4	52	3	96	104	104	0	6	0	2	0	0
W. NO. CEN.												
Minnesota	15	13	12	31	57	77	0	0	2	1	1	1
Iowa	2	48	4	35	58	62	1	1	2	0	2	2
Missouri	2	10	3	34	44	66	0	0	0	2	8	12
North Dakota	1	2	1	6	4	16	0	0	0	0	2	1
South Dakota	1	4	2	20	23	23	0	0	0	2	1	1
Nebraska	0	7	1	6	22	22	0	1	1	0	0	0
Kansas	1	20	3	44	59	71	0	0	0	1	1	3
SO. ATL.												
Delaware	3	0	0	8	3	5	0	0	0	2	3	3
Maryland [3]	4	1	1	21	20	35	0	0	0	6	6	9
Dist. of Col.	5	0	0	13	8	11	0	0	0	0	0	1
Virginia [2]	6	12	2	52	49	49	0	0	0	11	10	10
West Virginia	3	31	1	51	34	86	0	0	0	4	5	8
North Carolina [4]	5	1	1	85	128	92	0	0	0	2	3	9
South Carolina [2]	5	0	0	12	39	17	0	0	0	8	11	11
Georgia [2]	6	1	1	35	38	33	0	0	0	8	21	15
Florida	1	2	1	8	4	4	0	0	0	0	3	3
E. SO. CEN.												
Kentucky	5	13	5	78	56	73	0	0	0	12	23	13
Tennessee	22	4	4	80	81	66	0	1	0	6	7	7
Alabama [2]	12	4	3	36	40	39	1	0	0	7	11	11
Mississippi [2] [4]	7	3	3	13	21	17	1	0	0	4	2	5
W. SO. CEN.												
Arkansas	3	3	3	5	7	10	0	0	0	5	7	7
Louisiana [2]	1	3	1	4	10	13	0	0	0	6	7	9
Oklahoma [1]	5	0	0	18	23	23	1	2	2	4	15	13
Texas [2]	7	2	3	30	38	48	0	1	1	14	12	14
MOUNTAIN												
Montana	2	4	0	18	11	23	0	0	9	0	0	3
Idaho	0	4	1	14	13	13	0	1	2	2	0	3
Wyoming	0	9	0	3	11	9	0	0	0	0	1	0
Colorado	2	2	2	18	26	26	0	0	3	1	5	5
New Mexico	0	0	0	6	4	14	1	0	0	1	2	8
Arizona	0	0	0	1	3	3	0	0	0	0	0	1
Utah [3]	0	7	2	8	8	11	0	0	0	1	1	0
Nevada	0	0	------	0	1	------	0	0	------	5	0	------
PACIFIC												
Washington	6	13	3	28	27	27	0	0	1	1	6	3
Oregon	5	0	1	3	13	17	2	1	1	1	7	3
California	5	7	8	97	97	152	0	0	1	5	7	9
Total	294	434	197	1,902	2,129	2,756	14	28	38	178	239	325
43 weeks	7,885	8,383	6,245	103,238	131,380	154,452	1,244	2,080	8,662	7,419	8,399	12,303

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 25, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough	
	Week ended—	
	Oct. 25, 1941	Oct. 26, 1940
NEW ENG.		
Maine	29	9
New Hampshire	16	13
Vermont	17	14
Massachusetts	134	142
Rhode Island	31	4
Connecticut	49	81
MID. ATL.		
New York [2]	387	405
New Jersey	173	131
Pennsylvania	219	556
E. NO. CEN.		
Ohio	152	254
Indiana	14	19
Illinois	266	192
Michigan [1]	343	322
Wisconsin	260	168
W. NO. CEN.		
Minnesota	70	52
Iowa	20	6
Missouri	22	57
North Dakota	24	27
South Dakota	0	2
Nebraska	5	9
Kansas	35	54
SO. ATL.		
Delaware	2	21
Maryland [3]	41	81
District of Columbia	14	7
Virginia [2]	43	35
West Virginia	36	25
North Carolina [4]	91	61
South Carolina [2]	38	21
SO. ATL.—continued		
Georgia [2]	3	11
Florida	9	6
E. SO. CEN.		
Kentucky	81	88
Tennessee	36	35
Alabama [2]	26	28
Mississippi [2 3]	----------	----------
W. SO. CEN.		
Arkansas	10	14
Louisiana [2]	5	7
Oklahoma [4]	5	12
Texas [2]	72	96
MOUNTAIN		
Montana	31	0
Idaho	2	8
Wyoming	9	3
Colorado	44	27
New Mexico	13	19
Arizona	3	11
Utah [3]	10	27
Nevada	1	0
PACIFIC		
Washington	63	56
Oregon	14	10
California	155	263
Total	3,123	3,492
43 weeks	177,643	134,903

[1] New York City only.
[2] Typhus fever, week ended Oct. 18, 1941, 60 cases, as follows: New York, 1; Virginia, 1; South Carolina, 3; Georgia, 27; Alabama, 10; Mississippi, 1; Louisiana, 10; Texas, 16.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended Oct. 18, 1941, 2 cases, as follows: North Carolina, 1; Oklahoma, 1.
[5] Corrected figures for Arkansas indicate 15 cases of diphtheria and 23 cases of influenza for the week ended Sept. 27, instead of 21 and 17 cases, respectively, as shown in the Public Health Reports of Oct. 3, p. 1972.

WEEKLY REPORTS FROM CITIES

City reports for week ended October 11, 1941

This table lists the reports from 131 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	0	3	0	0	2	2	19
New Hampshire:											
Concord	0	------	0	0	0	2	0	1	0	0	8
Nashua	0	------	0	0	0	0	0	0	0	1	7
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	1	0	0	0	0	0	4
Massachusetts:											
Boston	1	------	0	2	9	19	0	2	1	19	187
Fall River	0	------	0	0	0	12	0	1	1	1	30
Springfield	0	------	0	14	0	14	0	0	1	5	35
Worcester	0	------	0	0	3	4	0	1	0	1	49
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	11
Providence	0	------	0	4	3	5	0	1	0	18	59
Connecticut:											
Bridgeport	0	1	1	0	0	0	0	0	0	1	26
Hartford	0	------	0	0	1	5	0	0	0	1	43
New Haven	0	------	0	13	1	3	0	0	1	3	33
New York:											
Buffalo	0	------	0	4	13	7	0	5	0	15	136
New York	16	3	0	17	51	30	0	78	6	158	1,354
Rochester	0	------	0	2	1	1	0	1	0	0	75
Syracuse	0	------	0	0	1	3	0	1	0	22	51
New Jersey:											
Camden	1	------	0	0	1	0	0	1	0	10	29
Newark	0	1	0	4	0	10	0	1	1	43	101
Trenton	0	------	0	1	1	5	0	4	0	0	46
Pennsylvania:											
Philadelphia	1	1	1	2	10	21	0	28	2	57	433
Pittsburgh	1	1	0	1	4	10	0	6	0	27	118
Reading	0	------	0	1	2	0	0	0	0	5	42
Scranton	0	------	------	1	------	0	0	------	0	0	------
Ohio:											
Cincinnati	0	------	1	0	1	7	0	8	0	10	144
Cleveland	0	7	2	2	2	13	0	7	6	42	163
Columbus	0	------	0	1	2	5	0	3	0	11	71
Toledo	0	------	0	0	1	1	0	4	0	19	60
Indiana:											
Anderson	0	------	0	0	1	0	0	0	0	0	15
Fort Wayne	0	------	0	0	2	0	0	0	0	0	21
Indianapolis	0	------	1	3	8	9	0	2	0	2	108
Muncie	0	------	0	0	2	1	0	0	0	1	9
South Bend	1	------	0	0	1	0	0	0	0	0	18
Terre Haute	0	------	0	0	0	0	0	2	0	0	25
Illinois:											
Alton	0	------	0	0	0	0	0	0	0	0	9
Chicago	9	6	3	7	20	33	0	21	1	108	603
Elgin	0	------	0	0	0	1	0	0	0	4	11
Moline	0	------	0	0	0	0	0	0	0	15	12
Springfield	0	------	0	0	0	0	0	0	0	0	21
Michigan:											
Detroit	1	------	0	17	6	32	0	7	1	60	219
Flint	0	------	0	0	3	1	0	0	0	4	21
Grand Rapids	0	------	1	0	1	1	0	1	1	4	38
Wisconsin:											
Kenosha	0	------	0	0	0	4	0	0	0	6	8
Madison	0	------	0	1	0	3	0	0	0	2	3
Milwaukee	0	------	0	4	10	12	0	2	0	90	97
Racine	0	------	0	0	0	1	0	0	0	1	6
Superior	0	------	0	1	0	0	0	0	0	0	7
Minnesota:											
Duluth	0	------	0	0	1	0	0	0	0	4	25
Minneapolis	0	------	0	0	2	13	0	0	1	16	86
St. Paul	0	------	0	0	2	5	0	2	0	22	50
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	0	------
Des Moines	0	------	0	0	0	2	0	0	0	1	24
Sioux City	0	------	------	0	------	1	0	------	0	2	------
Waterloo	0	------	------	0	------	1	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	0	5	10	0	5	1	3	100
St. Joseph	0	------	0	9	3	1	0	0	0	0	23
St. Louis	3	------	0	1	5	8	0	8	2	5	168

City reports for week ended October 11, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
North Dakota:											
Fargo	0	-----	0	0	0	0	0	0	0	3	8
Grand Forks	0	-----	-----	0	-----	1	0	-----	0	0	-----
Minot	0	-----	0	6	0	0	0	0	0	1	8
South Dakota:											
Sioux Falls	0	-----	0	0	0	0	0	0	0	0	12
Nebraska:											
Lincoln	0	-----	-----	0	-----	0	0	-----	0	1	-----
Omaha	0	-----	0	1	1	4	0	1	0	0	47
Kansas:											
Lawrence	0	-----	0	0	0	0	0	0	0	0	9
Topeka	0	-----	0	0	0	3	0	0	0	1	3
Wichita	1	-----	0	2	1	0	0	1	0	2	27
Delaware:											
Wilmington	0	-----	0	0	1	4	0	1	0	0	32
Maryland:											
Baltimore	0	1	0	8	8	15	0	12	0	84	247
Cumberland	0	-----	0	0	0	2	0	0	0	0	11
Frederick	0	-----	0	0	1	0	0	0	0	0	7
District of Columbia:											
Washington	2	2	0	7	5	11	0	11	0	17	121
Virginia:											
Lynchburg	2	-----	0	1	0	0	0	0	1	1	6
Norfolk	2	-----	0	0	1	1	0	0	0	2	19
Richmond	0	-----	0	0	1	2	0	3	0	0	51
Roanoke	0	-----	0	0	0	1	0	0	0	1	14
West Virginia:											
Charleston	0	1	0	0	0	0	0	0	0	2	41
Huntington	0	-----	-----	1	-----	0	0	-----	0	1	-----
Wheeling	0	-----	0	9	2	0	0	1	0	1	16
North Carolina:											
Gastonia	0	-----	-----	0	-----	0	0	-----	0	0	-----
Raleigh	2	-----	0	0	1	2	0	0	0	3	13
Wilmington	0	-----	0	0	2	0	0	0	0	9	14
Winston-Salem	0	1	0	0	2	1	0	3	0	0	18
South Carolina:											
Charleston	0	4	0	0	3	0	0	1	1	0	25
Florence	0	-----	0	0	0	1	0	0	0	0	7
Greenville	1	-----	0	0	0	3	0	0	0	2	6
Georgia:											
Atlanta	0	3	0	0	0	8	0	5	0	0	58
Brunswick	0	-----	0	0	0	0	0	0	0	0	1
Savannah	0	-----	0	0	1	2	0	1	0	0	22
Florida:											
Miami	0	-----	0	1	4	0	0	1	0	0	46
St. Petersburg	0	-----	0	0	2	0	0	0	0	0	15
Kentucky:											
Ashland	1	-----	0	0	0	0	0	0	0	1	4
Covington	1	-----	0	0	2	3	0	0	0	0	11
Lexington	0	-----	0	0	0	0	0	0	0	2	11
Tennessee:											
Knoxville	1	-----	0	0	1	1	0	2	0	0	23
Memphis	1	-----	0	1	0	0	0	1	0	10	68
Nashville	0	-----	0	0	3	3	0	2	0	13	44
Alabama:											
Birmingham	0	2	1	2	1	6	0	6	1	1	71
Mobile	0	-----	0	0	0	0	0	0	0	0	28
Montgomery	1	-----	-----	0	-----	3	0	-----	0	0	-----
Arkansas:											
Fort Smith	1	-----	-----	0	-----	2	0	-----	0	0	-----
Little Rock	0	-----	0	0	2	0	0	1	0	0	24
Louisiana:											
Lake Charles	0	-----	0	0	0	0	0	1	0	0	2
New Orleans	8	1	0	0	11	3	0	4	2	8	133
Shreveport	2	-----	0	0	3	2	0	4	0	0	40
Oklahoma:											
Oklahoma City	0	-----	0	0	3	1	0	2	0	0	45
Tulsa	2	-----	0	8	0	1	0	0	0	0	20
Texas:											
Dallas	4	-----	0	1	0	6	0	2	1	5	54
Fort Worth	5	-----	0	0	1	2	0	1	1	6	22
Galveston	0	-----	0	0	1	0	0	1	0	0	14
Houston	0	-----	0	0	8	2	0	2	0	1	79
San Antonio	0	-----	0	0	4	1	0	5	0	0	48

City reports for week ended October 11, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	8
Great Falls	0	------	0	0	1	0	0	0	0	1	8
Helena	0	------	0	1	0	0	0	0	0	0	4
Missoula	0	------	0	0	3	0	0	0	0	0	10
Colorado:											
Colorado Springs	0	------	0	0	1	4	0	0	1	5	14
Denver	2	19	0	4	5	1	0	9	0	26	97
Pueblo	0	------	0	8	1	2	0	0	0	0	7
New Mexico:											
Albuquerque	0	------	0	1	0	1	0	1	0	0	9
Arizona:											
Phoenix	0	1	------	2	------	0	0	------	0	1	------
Utah:											
Salt Lake City	0	------	0	2	1	2	0	0	0	7	32
Washington:											
Seattle	1	------	0	1	4	5	0	0	1	11	80
Spokane	0	------	0	0	3	2	0	0	0	4	30
Tacoma	0	------	0	0	0	1	0	0	0	2	17
Oregon:											
Portland	0	------	0	1	3	2	0	0	0	2	97
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	0	3	2	5	5	14	0	21	3	34	372
Sacramento	3	------	0	0	2	0	0	2	0	2	46
San Francisco	0	7	0	2	5	3	0	9	0	11	134

State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths	
Maine:			
Portland	0	0	2
New Hampshire:			
Concord	0	0	1
Massachusetts:			
Boston	3	1	2
Fall River	0	0	1
Rhode Island:			
Providence	0	0	1
Connecticut:			
Bridgeport	0	0	1
New York:			
New York	1	1	24
Rochester	0	0	7
Syracuse	0	0	3
New Jersey:			
Newark	0	0	1
Pennsylvania:			
Philadelphia	1	1	4
Pittsburgh	0	0	1
Scranton	0	0	1
Ohio:			
Cincinnati	0	0	1
Cleveland	0	0	8
Illinois:			
Chicago	1	0	15
Michigan.			
Detroit	0	0	6
Grand Rapids	0	0	1
Minnesota:			
Duluth	0	0	2
Minneapolis	0	0	1
St. Paul	0	0	13
Missouri:			
St. Louis	1	0	0
North Dakota:			
Fargo	0	0	1
Delaware:			
Wilmington	0	0	2
Maryland:			
Baltimore	2	0	2
District of Columbia:			
Washington	0	0	3
Virginia:			
Norfolk	0	0	2
Richmond	1	0	0
South Carolina:			
Charleston	1	0	0
Greenville	1	0	0
Georgia:			
Atlanta	0	0	1
Tennessee:			
Knoxville	0	0	1
Nashville	0	0	5
Alabama:			
Birmingham	0	0	2
Montgomery	0	0	2
Louisiana:			
New Orleans	0	0	3
Texas:			
Fort Worth	0	0	1
Houston	0	1	0
San Antonio	0	0	2
Utah:			
Salt Lake City	0	0	2
Washington:			
Seattle	0	0	4
California:			
Los Angeles	0	0	2
San Francisco	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Minneapolis, 1; Denver, 1. Deaths: Duluth, 1; Minneapolis, 1; Omaha, 2.

Pellagra.—Cases: Savannah, 7; New Orleans, 2; Oklahoma City, 1; Phoenix, 2.

Typhus fever.—Cases: Norfolk, 1; Winston-Salem, 1; Atlanta, 2; Savannah, 1; Miami, 2; Memphis, 1; Birmingham, 1; Mobile, 1; New Orleans, 6; Fort Worth, 4; Houston, 1. Deaths: Miami, 1.

Rates (annual basis) per 100,000 population for a group of 88 selected cities (population, 1940, 33,794,591)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Oct. 11, 1941	8.79	9.87	2.01	25.46	40.42	64.34	0.00	47.37	5.86	222.03
Average for week, 1936-40	19.80	9.67	3.12	42.42	56.29	81.46	0.47	49.43	7.49	147.67

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS AND CHIPMUNKS IN SISKIYOU COUNTY, CALIF.

Under date of October 16, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 4 fleas from 12 chipmunks shot September 5 in Shasta National Forest, 5 miles east and 1 mile north of Mount Shasta City, and in 3 pools of fleas from ground squirrels, *C. douglasii*, as follows: In a pool of 103 fleas from 4 ground squirrels submitted to the laboratory on September 3 from a ranch 1½ miles east of Yreka; in a pool of 86 fleas from 5 ground squirrels shot September 3 at a ranch 4 miles north of Montague; in a pool of 100 fleas from 5 ground squirrels submitted to the laboratory on September 13 from property of the Southern Pacific Railway inside the city limits of Mount Shasta City. All of the localities are in Siskiyou County, Calif.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on September 26, 1941, in Paauhau, Hamakua District, Island of Hawaii, T. H., has been proved positive for plague.

FOREIGN REPORTS

BERMUDA

Dengue—Influenza.—According to information received through official sources from the American Consul at Hamilton, Bermuda, under date of October 29, 1941, the medical officer of health of Bermuda reported 92 cases of dengue fever and 58 cases of influenza. It was stated that the type of dengue fever was causing the medical officers some concern and that the Colonial Secretary had requested aid from the Rockefeller Institute in New York.

CANADA

Provinces—Communicable diseases—Week ended September 20, 1941.—During the week ended September 20, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		5		5	3					13
Chickenpox		5		22	50	10	5		22	114
Diphtheria		10	2	42	1	2				57
Dysentery				4	1					5
Influenza		11				1			3	15
Lethargic encephalitis						1	42[1]	1		44
Measles			2	212	19	6	2	1	46	288
Mumps				82	38	15	8	2	27	172
Pneumonia	4	12			1				1	18
Poliomyelitis		1	27	10	3	28	7	16	6	98
Scarlet fever		10	4	63	90	10	7	7	16	207
Trachoma								1		1
Tuberculosis	2	5	6	63	56	2	19	2		155
Typhoid and paratyphoid fever		7	4	11	5	1	9	2	4	43
Whooping cough	3	5	2	123	141		5	3	6	288

[1] Encephalomyelitis.

Manitoba—Winnipeg—Poliomyelitis.—From the week ended June 21 to the week ended September 27, 1941, a total of 247 cases of poliomyelitis was reported in Winnipeg. Most of the cases occurred in children. Approximately 1 in 3 (87, or 35 percent) developed some degree of paralysis, while 7 died (a case fatality rate of about 3 percent). The incidence rate for the period of the epidemic is given as 105 per 100,000 population.

CUBA

Provinces—Notifiable diseases—4 weeks ended September 13, 1941.—During the 4 weeks ended September 13, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		2	9		8	20
Chickenpox						1	1
Diphtheria		12	1	8		3	19
Hookworm disease		36		1			37
Leprosy		2					2
Malaria	144	17		51	2	39	253
Measles		5	1	2	1		9
Poliomyelitis		2				1	3
Tuberculosis	9	33	17	75	25	45	204
Typhoid fever	24	52	14	45	12	24	171
Undulant fever				1			1
Whooping cough				2			2
Yaws						4	4

[1] Includes the city of Habana.

ITALY

Notifiable diseases—1939–40.—During the years 1939 and 1940 cases of certain notifiable diseases were reported in Italy as follows:

Disease	1939	1940	Disease	1939	1910
Anthrax	890	710	Mumps	10, 279	18, 190
Cerebrospinal meningitis	1, 451	3, 023	Paratyphoid fever	4, 271	4, 707
Chickenpox	16, 136	15, 946	Pellagra	699	540
Diphtheria	28, 478	26, 354	Poliomyelitis	6, 007	2, 407
Dysentery (amoebic)	937	893	Puerperal fever	1, 359	1, 080
Dysentery (bacillary)	645	1, 191	Scarlet fever	12, 185	11, 010
German measles	58, 619	59, 954	Smallpox	4	
Hookworm disease	2, 003	1, 708	Syphilis	621	918
Influenza	66, 885	16, 881	Typhoid fever	25, 981	26, 103
Leprosy	24	32	Undulant fever	4, 027	4, 615
Lethargic encephalitis	69	81	Whooping cough	22, 025	24, 881
Malaria	55, 453	60, 708			

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.- Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–July 1941	August 1941	September 1941—week ended—			
				6	13	20	27
ASIA							
Ceylon	C		1				
China:							
Canton	C	329	77			4	
Hong Kong	C	1,303	244	27			
Macao	C	541	239	126		75	106
Shanghai	C	[1] 36	450		83	40	28
India:							
Bombay	C	[2] 11					
Calcutta	C	1,826					
Rangoon	C	69	6				
India (French)	C	34					
Japan: Taiwan	C	2					

[1] For July. [2] For 2 weeks only.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases]

Place		January–July 1941	August 1941	September 1941—week ended— 6	13	20	27
AFRICA							
Belgian Congo	C	6					
British East Africa:							
Kenya	C	138					
Uganda	C	73					
Egypt: Port Said	C	8					
Madagascar	C	104	8	2		3	
Morocco	C	1,762	244	22	14	11	12
Casablanca.[1]							
Tunisia: Tunis	C	2					
Union of South Africa	C	68					
ASIA							
China: Foochow	C	3					
Dutch East Indies:							
Java and Madura	C	396					
West Java	C	202					
India:							
Calcutta	C	3					
Rangoon	C	6					
Indochina (French)	C	18	1	2			1
Palestine: Haifa	C	2					
Plague-infected rats		10					
Thailand: Lampang Province	C	1					
EUROPE							
Portugal: Azores Islands	C		1				
NORTH AMERICA							
Canada—Alberta—Plague-infected ground squirrel		1					
SOUTH AMERICA							
Argentina:							
Cordoba Province	C	[2] 21					
Santa Fe Province—Plague-infected rats		67					
Chile: Valparaiso.[3]							
Ecuador	C	33					
Peru:							
Ancash Department	C	1					
Lambayeque Department	C	2					
Libertad Department	C	6					
Lima Department	C	6	2				
Moquegua Department—Ilo	C	7					
Piura Department	C	2					
OCEANIA							
Hawaii Territory:[4] Plague-infected rats		47	1	1	1	1	1
New Caledonia	C	9					

[1] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco, where several deaths had been reported.
[2] Includes 3 cases of pneumonic plague.
[3] A report dated October 13, states that 1 case of plague occurred in Valparaiso, Chile.
[4] During April and May, 4 lots of plague-infected fleas were reported in Hawaii Territory.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases]

Place		January-July 1941	August 1941	September 1941—week ended— 6	13	20	27
AFRICA							
Algeria	C	220	91	11		36	
Angola	C	[1] 29					
Belgian Congo	C	333					
British East Africa	C	22					
Dahomey	C	464					
French Guinea	C	45					
Ivory Coast	C	39					
Morocco	C	155					
Nigeria	C	677					
Niger Territory	C	258	6				
Portuguese East Africa	C	9					
Rhodesia: Southern	C	86					
Senegal	C	56					
Sierra Leone	C	15					
Sudan (Anglo-Egyptian)	C	7					
Sudan (French)	C	19					
Union of South Africa	C	370					
ASIA							
Ceylon	C	108	6				
China	C	237	6			1	
Chosen	C	696					
Dutch East Indies—Bali Island	C	3					
India	C	11,898					
India (French)	C	9					
India (Portuguese)	C	70					
Indochina (French)	C	895	43				[2] 96
Iran	C	8					
Iraq	C	1,036	24	19			
Japan	C	200					
Straits Settlements	C	1					
Syria	C	1					
Thailand	C	234					
EUROPE							
France	C	1					
Portugal	C	31	3	1			
Spain	C	186	53	13	13	13	
NORTH AMERICA							
Canada	C	22	1				
Dominican Republic	C	2					
Guatemala	C	5					
Mexico	C	27					
SOUTH AMERICA							
Bolivia	C	[3] 18					
Brazil	C	1					
Colombia	C	527	2				
Paraguay	C	[3] 8					
Peru	C	778					
Uruguay	C	7					
Venezuela (alastrim)	C	163	18		10		

[1] For June.
[2] For September.
[3] For January, February, and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases]

Place		January-July 1941	August 1941	September 1941—week ended— 6	13	20	27
AFRICA							
Algeria	C	8,894	647	102		50	
British East Africa: Kenya	C	[1] 2					
Egypt	C	4,581					
Morocco	C	770	88	5	7	7	7
Sierra Leone	C	5					
Tunisia	C	4,358	435	34	62	53	16
Union of South Africa	C	274					
ASIA							
China	C	198	24	1			
Chosen	C	397					
Iran	C	105					
Iraq	C	36	3				
Japan	C	840					
Malaya: Unfederated States	C		1				
Palestine	C	41					
Straits Settlements	C	6	1				
Trans-Jordan	C	6					
EUROPE							
Bulgaria	C	214	8		2		
France (unoccupied zone)	C	[2] 2					
Germany	C	1,406	125	27	45	56	
Gibraltar	C	2					
Greece	C	7					
Hungary	C	355	15		17	21	
Irish Free State	C	26					
Poland	C	700	5				
Portugal	C	5					
Rumania	C	687	31		2	16	11
Spain	C	[3] 8,906		73	48	37	
Switzerland	C	5					
Turkey	C	623					
Yugoslavia	C	78					
NORTH AMERICA							
Guatemala	C	125	20				
Mexico	C	95					
Panama Canal Zone	C	3					
Puerto Rico	C	[4] 3			1		
SOUTH AMERICA							
Bolivia	C	75					
Brazil	C	1					
Chile	C	120					
Colombia	C	[5] 1					
Ecuador	C	65	30				
Peru	C	1,079					
Venezuela	C	35	3				
OCEANIA							
Australia	C	11	1				
Hawaii Territory	C	17	3		7	5	2

[1] For April.
[2] For June.
[3] For the period January to August inclusive.
[4] For July.
[5] For January, February, and March.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January–July 1941	August 1941	September 1941—week ended—			
				6	13	20	27
AFRICA							
Belgian Congo:							
Kimvulu	C	1					
Libenge	C	1					
French Equatorial Africa:							
Gabon	C	2					
Mayumba	C	4					
Gold Coast: Accra	C	1					
Ivory Coast [1]	C	[2] 4	1				
Nigeria	C		[3] 1				
Spanish Guinea	D	4					
SOUTH AMERICA [4]							
Brazil:							
Amazonas State	D	2					
Bahia State	D	2					
Para State	D	2	1				
Colombia:							
Antioquia Department	D	2					
Boyaca Department	D	8					
Intendencia of Meta	D	4	1	1			
Santander Department	D	5	7				
Tolima Department	D	1					
Peru: Junin Department	C	5					
Venezuela: Bolivar State	C		1				

[1] During the week ended October 11, 1 death from yellow fever was reported in Bouake, Ivory Coast.
[2] Includes 2 suspected cases.
[3] Suspected.
[4] All yellow fever reported in South America is of the jungle type unless otherwise specified.

COURT DECISION ON PUBLIC HEALTH

Possession of unwholesome poultry held violative of sanitary code.—(New York Court of Appeals; *People* v. *Swift & Co.*, 35 N.E.2d 652; decided June 12, 1941.) In November 1939, inspectors of the New York City Health Department made a routine visit to a place of business maintained by the defendant company in Brooklyn. After finding the food on the main floor, the salesroom, to be in satisfactory condition, they went to the cooler in the basement where poultry was kept awaiting removal to the salesroom and there found at least twenty-two pieces of poultry, weighing approximately 120 pounds, which were unwholesome. This poultry had not undergone all of the three inspections which the defendant conducted before selling or offering for sale.

The witnesses for the defendant testified that poultry was inspected when it was delivered to the defendant and again when it was sent from the basement cooling room to the main floor for sale. Both of these inspections were merely on a sampling basis, that being the custom of the trade. Three to five boxes were examined out of a lot which might range from twenty-five to four hundred boxes, the examination consisting of removing the top cover of the box and looking at the breast of the chicken. Only if the breast revealed a condition which aroused suspicion did the examination go beyond this. Mold on the backs or sides of the poultry would escape detection. The defendant explained that the unwholesome condition of the poultry condemned escaped its attention because the mold was on the so-called hips of the chickens. The third and last inspection was made by the customer at the time that he bought the poultry, this inspection involving the opening of all boxes. However, at times—although the defendant insisted that such occasions were rare—this final examination was omitted and, according to the court, apparently depended entirely upon the wishes of the customer, when present, rather than the protection of the public.

The city sanitary code provided, among other things, that no poultry which was not healthy, wholesome, or safe for human food, or that died by disease or accident, should be brought into the city or held, kept, offered for sale, or sold as food (sec. 163). There were other provisions that food in the possession of a dealer in food should, prima facie, be deemed to be held, kept, or offered for sale as food (sec. 138), that the presence of food in any part of the establishment should be deemed prima facie evidence of its use for human food (sec. 148, reg. 23), and that food which had become unfit for human consumption should be kept separate from other foodstuffs which were held, kept, and offered for sale, marked "condemned," and removed daily (sec. 148, reg. 27).

In the trial court there had been a judgment of conviction for violation of section 163 of the sanitary code. The appellate division of the State supreme court had reversed this judgment, dismissed the information, and remitted the fine.[1] On appeal by the people the court of appeals said that the trial court had pointed out that the inspections employed were inadequate to reveal unwholesomeness, while the appellate division had reversed upon the ground that, while it was true that the poultry was intended to be sold, it was also equally true that it was not to be sold if it had been found by the defendant or the customer to be unwholesome. The question presented to the court of appeals was whether a judgment of conviction for the possession for sale of decomposed and unhealthy food kept in a storeroom from which salesmen replenished stock for sale in New York City could be reversed solely on the ground that the defendant had acted in good faith.

In concluding that the order of the appellate division should be reversed and the judgment of the trial court affirmed, it was stated that the method of inspection employed by the defendant would not necessarily have revealed the unhealthy condition of the poultry and that in such case there was a violation by the mere holding for sale of the food upon the premises even though it might be that a buyer would inspect before buying or that the poultry would be reinspected by the defendant. "We have here, therefore, a clear violation of the sanitary code, secs. 163, 138, 148, reg. 27." The concluding portion of the opinion read as follows:

> The danger to human life and health from unwholesome food is so great that the courts generally have treated food differently from most other products. It has been placed in the same category as drugs, poisons, and other instrumentalities which, if they are negligently dealt with, are ordinarily certain to affect seriously the public health and safety. The good intentions of the defendant would matter very little to consumers who might consume this poultry. Food laws are designed primarily, not for the punishment of the dealer, but for the protection of the consumer. In this field of law, the obligation to beware is on the seller rather than the buyer. Lack of proof of guilty intent does not satisfy that obligation.

[1] See Public Health Reports, April 18, 1941, p. 858.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 **NOVEMBER 7, 1941** NUMBER 45

IN THIS ISSUE

CONTENTS

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

Vol. 56 • NOVEMBER 7, 1941 • No. 45

POSITIVE AGGLUTINATION TESTS IN SUSPECTED CASES OF WEIL'S DISEASE*

By Ardzroony Packchanian, *Division of Infectious Diseases, National Institute of Health, United States Public Health Service*

With the aid of agglutination tests (*19, 20, 27*) and of inoculation tests of susceptible animals (*15, 16, 17, 18*), both developed during the past 10 years, an increasing number of cases of Weil's disease have been revealed throughout the world, not only in man but also in dogs and rodents (*3, 5, 7, 9, 13, 17, 24*).

Up to 1935 there had been only 12 proved cases of Weil's disease (icterohaemorrhagic spirochetosis) reported in man in the United States and Canada (*1, 2, 4, 11, 12, 25, 28*). During the past 5 years, however, this number has been nearly doubled (*6, 8, 9, 10, 13, 14, 16, 17, 24*) and, in all probability, this represents only a small portion of the cases which may have occurred but which missed diagnosis.

The object of the present study is to call attention to the value of the agglutination test for the diagnosis of Weil's disease and to report 40 new human cases in the United States diagnosed during the past 4 years by the writer by the use of such a procedure.

Four of the forty cases recorded in this communication are known to have been reported by the attending physicians. These cases are designated in table 1 as Nos. 1, 18, 23, and 25 (*9, 10, 14, 31*).

MATERIALS AND METHODS

Clinical materials.[1]—Samples of blood or blood serum taken from 447 human cases of suspected infectious jaundice, yellow fever, or Weil's disease were sent directly by attending physicians, or through State or local health departments, to the National Institute of Health in Washington for diagnosis. From 82 additional cases, 82 specimens of blood and 39 specimens of urine were collected by the writer with the cooperation of local health officers and physicians during out-

*Submitted for publication Jan 3, 1941

[1] It is impossible to mention the names and addresses of all physicians and health officers who sent us the specimens and whenever requested, brief clinical histories of their patients The writer is indebted to all attending physicians and health officers for their kind cooperation in this study The names of the physicians who attended the 40 positive cases of Weil's disease will be found in table 1

breaks of infectious jaundice in the States of Michigan, Minnesota, and Pennsylvania.

Agglutination tests.—The microscopic agglutination test for diagnosis of Weil's disease as described by Schüffner (*19, 20*) was used with slight modification. In its principle and procedure the test is similar to the typhoid agglutination test.

The agglutination reactions were recorded after 2 hours' incubation at 30° C. Only the samples which gave complete agglutination reactions with the antigen of type I *Leptospira icterohaemorrhagiae*[2] were recorded as positive. (See table 1.) Delayed and partial agglutination reactions in low dilutions were considered doubtful and are omitted from this communication.[3]

The antigen was prepared as follows: The *Leptospira icterohaemorrhagiae* (type I) was grown in liquid medium (each tube contained 5 cc. of buffered Ringer's-peptone solution and 0.5 cc. of rabbit serum)[4] at 30° C. When the growth was at its maximum, usually from the third to the eighth days, the growth of several tubes, depending on the need, was combined in a sterile flask. To each 100 cc. of antigen from 0.2 to 0.3 cc. of formalin was added in order to render the spirochetes motionless; it was then shaken vigorously for a few minutes, a drop was examined microscopically to ascertain that *Leptospira* were no longer motile or in clumps, and the whole was centrifuged at low speed to remove the coarse particles which settled in the bottom of the centrifuge tube. The supernatant fluid containing many leptospirochetes was used as antigen. Since the culture media did not interfere with the test, the spirochetes were not washed in physiological salt solution, and, because of the rich growth, it was not concentrated. The turbidity of freshly prepared formalinized antigen was about the same density as that of stock typhoid vaccine. To the serum dilutions equal amounts of freshly prepared formalinized antigen were added (the final serum dilutions ranged from 1:10 to 1:30,000), mixed and incubated 2 hours at 30° C., after which a droplet from each dilution was examined microscopically without cover glass, with low power (objective 21, ocular 10×) by dark-field illumination. Some of the positive samples later on were diluted to as high as 1:409,600

[2] *Leptospira icterohaemorrhagiae* (Inada and Ido, 1915), emend. Noguchi, 1917, has several synonyms as follows: (?*Spirochaeta*) *interrogans*, Stimson, 1907; *Spirochaeta icterohaemorrhagiae*, Inada and Ido, 1915; *Spirochaeta nodosa*, Huebener and Rieter, 1915; *Spirochaete icterogenes*, Uhlenhuth und Fromme, 1916; *Leptospira icteroides*, Noguchi, 1919; *Leptospira canicola*, Klarenbeek and Schuffner, 1934; *Leptospira interrogans*, (Stimson, 1907) emend. Wenyon, 1926 (*17, 21, 22, 23, 30*).

[3] In view of the fact that at least 4 agglutination types of *Leptospira* are known to exist (*17*), doubtful and negative clinical specimens were saved to be tested later with new strains of *Leptospira*. Serum samples from 36 cases of Weil's disease after storage in the refrigerator at about 5° C. from 169 to 1,078 days were retested and the majority of the samples were found to be still diagnostic in value. (See table 2.) Sera from present cases, with few exceptions, were tested with type I *Leptospira icterohaemorrhagiae*, which appears to be the one most prevalent and of world-wide distribution.

[4] The basic liquid medium supporting the growth of *Leptospira* is known as Vervoort's medium. It is made by adding 3 grams of peptone, 600 cc. of Ringer's solution, and 300 cc. of phosphate buffered solution having a pH of 7.2, to 1,500 cc. of water.

in order to learn the highest agglutinating titer. However, for the routine work the final dilutions up to 1:30,000 were selected as simple and adequate procedure for diagnostic purposes. Regular dark-field condenser and Leitz special dark-field condenser D. O. 80 were used with "dry" objective of low (× 210) and medium (× 450) powers.

Direct microscopic examination of blood of patients.—Blood specimens from 9 suspected cases sent to Washington by attending physicians, and blood specimens from 39 out of 82 cases collected by the writer in the field, were examined by dark-field illumination under oil immersion lens (objective 93× ocular 10×) for *Leptospira.*

Animal inoculations.—A limited number of specimens of blood (cases 7, 8, 11, 17, 18, 23, 25, 28, and 39), taken during the later stages of illness, were inoculated into young guinea pigs and deer mice (*Peromyscus eremicus*, *P. maniculatus*, and *P. polionotus* (*17*)). Usually these specimens were drawn during the latter part of the illness and were in transit for 1 to 5 days before reaching Washington through the mail. In addition, specimens of blood or urine, or both, collected from 82 patients living in the States of Michigan, Minnesota, and Pennsylvania, and suffering from infectious jaundice ("infective hepatitis") were inoculated into susceptible animals for possible detection of *Leptospira.* The outbreaks in Michigan and Pennsylvania affected, for the most part, young persons from about 4 to 23 years of age, while the outbreak in Minnesota affected both young persons and adults. During the epidemic special efforts were made to collect specimens from cases of infectious jaundice at various stages of the illness, ranging from about 2 to 30 days following the onset. The tail blood of the inoculated deer mice was examined under cover-glass preparation by dark-field illumination daily, or every other day, while the blood from guinea pigs' ears was examined on about the sixth to the fourteenth day following inoculation. From about the end of the third week up to 2 months, the surviving animals were all killed and the heart blood was used for agglutination tests.

DATA

Results of microscopic agglutination tests.—As shown in table 1, serum specimens from 40 scattered cases agglutinated with formalinized antigen of type I *Leptospira icterohaemorrhagiae.* All these sera gave strong agglutination reactions in dilution of 1:100. In 3 cases the highest agglutination titer was 1:300; in 2 cases, 1:1,000; in 1 case, 1:3,000; in 7 cases, 1:10,000; while 27 cases gave an agglutination titer of 1:30,000 and over. The urine of case 39 likewise gave a prompt agglutination reaction in dilutions up to 1:100. The agglutination titer in all these cases at the dilution mentioned was prompt and completed within 2 hours.

TABLE 1.—*Diagnosis of 40 human cases of Weil's disease as determined by agglutination tests with type I Leptospira icterohaemorrhagiae*

Case No.	Attending physician	Color	Age	Geographical distribution	Occupation	Onset of illness	Number of samples from each case	Number of days following onset	Agglutination reaction, dilution of serum						Outcome of illness
									1:100	1:300	1:1,000	1:3 000	1:10,000	1:30,000	
1	Dr. John R. Paul	W	30	New Haven, Conn.	Farm hand	Nov. 1939	a	38	++++	++++	++++	++++	++++	++	Recovered.
							b	47	++++	++++	++++	++++	++++	++++	
2	Capt. Albert R. Dreisbach	W	(1)	Washington, D. C	Veteran	Aug. 1939	a	(2)	++++	++++	++++	++++	++++	++++	Do.
3	Dr. J. G. Parker	W	37	New Orleans, La.	Mechanic in cotton-warehouse.	July 1939	a	30	++++	++++	++++	+	0	0	Do.
							b	52	++++	++++	++++	++++	++++	++++	
4	Dr. R. S. Schear	W	17	do		Sept. 1930	a	9+	++++	++++	++++	++	0	0	Do.
							b	15	++++	++++	++++	++++	++	0	
5	Dr. Pullen and Dr. St. Martin.	C	19	do		Oct. 1939	a	*	++++	++++	++++	++++	+++	+++	Do.
6	Drs. Jos. E. Holoubek and Alice E. Baker.	W	54	do		Mar. 1940	a	21±	++++	++++	++++	++++	++++	++++	Do.
7	Drs. Kendall Emerson, Jr., and Perrin H. Long.	W	50	Baltimore, Md	Steel worker	Oct. 1937	b	57	++++	++++	++++	+++	+++	++	Do.
8	Do	W	69	do	Grass cutter	Sept. 1937	a	53	++++	++++	++++	++++	++++	+	Do.
9	Drs. K. Emerson, Jr., L. W. Ladd, Jr., and Perrin H. Long.	C	(1)	do	Floor scrubber	June 1938	b	8±	++++	++++	++++	++++	++++	++++	Died.
10	Drs. K. Emerson, Jr., and P. H. Futcher.	W	31	do	Garbage collector.	Aug. 1938	c	18	++++	++++	++++	++++	++++	++++	Recovered.
11	Drs. O. R. Austrian and G. E. Levi.	W	28	do	Milkman on farm	Sept. 1938	a	16	++++	++++	++++	++++	++++	++++	Do.
12	Drs. John T. King and D. Hollander.	C	51	do	Housewife	Sept. 1938	a	(3)	++++	++++	+++	+++	++	±	Died.
13	Dr. Vernon H. Norwood	W	11	do	School boy, lives in shack.	Aug. 1939	a	42	++++	++++	++++	++++	+++	+++	Recovered.
14	Dr. Alice S. Myers (in service of Dr. Edwards A. Park).	W	7	do	School boy (brother of case 15).	Sept. 1940	a	*	++++	++++	++++	++++	++++	++++	Do.
							b	*	++++	++++	++++	++++	++++	++++	
15	Do	W	9	do	School boy (brother of case 14).	Sept. 1940	a	*	+++	0	0	0	0	0	Do.
							b	*	++++	++++	++++	++++	++++	++++	
16	Drs. David Litchman and J. D. Cohen.	W	24	Boston, Mass.	Butcher in an abattoir	July 1938	d	45	++++	++++	++++	++++	++++	++++	Do.
17	Drs. H. C. Burrell and F. L. Burnett.	W	(1)	Gloucester, Mass.		June 1939	a	(4)	++++	++++	++++	+++	++	0	Died.
18	Drs. Wm. H. Gordon and Joseph C. Molner.	W	32	Detroit, Mich.	Poultry business	Feb. 1938	a	21	++++	++++	++++	++++	++++	++++	Recovered.
19	Drs. Arthur A. Humphrey and Kenneth Lown.	W	39	Battle Creek, Mich.	Laborer (cereal manufacturing).	Sept. 1939	a	(2)	++++	++++	+++	0	0	0	Do.

20	Drs. Carl R. Ferris and C. F. Kent.	W	(1)	Kansas City, Mo.	Bridge builder, iron worker.	Jan. 1938	a	71	++++	++++	++++	+++	+	0	Do.
21	Do.	W	46	do.	Bridge construction	Feb. 1938	a	(2)	++	+	0	0	0	0	Do.
22	Drs. Harry E. Fightlin and Cyrus Sergir.	W	21	Reno, Nev.	Junk yard, handling scrap iron.	July 1938	a b	6+ 33	++++ ++++	++++ ++++	+++ ++++	0 ++++	0 ++++	0 ++++	Do.
23	Dr. Walter Haschec.	W	17	Orange, N. J.	School boy, trapping rats.	Aug. 1938	a	33	++++	++++	++++	++++	++++	++++	Do.
24	Drs. Grace E. Lutman and Milton Manette.	W	32	Jersey City, N. J.	Skinning lambs	Nov. 1939	c	20±	++++	++++	++++	++++	++++	++++	Do.
25	Drs. A. R. Kantrowitz and S. Glotzer.	W	33	Brooklyn, N. Y.	Fish cutter in a market	Oct. 1937	b e	20 165	++++ ++++	++++ ++++	++++ ++++	++++ ++++	++++ ++++	++++ ++++	Do.
26	Dr. A. R. Kantrowitz	W	36	do.	do.	Aug. 1938	a	(2)	++++	++++	++++	++++	++++	++++	Do.
27	Lt. Col. A. Carbonell	W	(1)	West Point, N. Y.	Sign painter	July 1938	a	24	++++	++++	++++	++++	++++	++++	Do.
28	Dr. A. R. Kantrowitz	W	64	Brooklyn, N. Y.	Trolley-car motorman	Dec. 1939	a	(3)	+++	++	0	0	0	0	Do.
29	Dr. Ward J. MacNeal and Dr. Elliston Farrall.	W	37	New York City	Clerk in a fish market	Sept. 1939	a	(4)	++++	++	0	0	0	0	Died.
30	Dr. C. W. Kumpe	C	32	Cincinnati, Ohio	Fish cleaner	June 1939	a	16	++++	++++	++++	++++	++++	++++	Recovered.
31	Do.	C	19	do.	do.	June 1939	a	21	++++	++++	++++	++++	+++	0	Do.
32	Drs. Wm. F. Ashe and R. E. Stoner.	W	(1)	do.		July 1939	a	(3)	++++	++++	++++	++++	++++	++	Do.
33	Dr. Wm. F. Ashe	W	(1)	do.		Oct. 1939	a	(2)	++++	++++	++++	++++	0	0	Do.
34	Drs. F. B. Faust, C. J. Buckner, and H. H. Reimann.	W	24	Philadelphia, Pa.	Furniture store employee.	Sept. 1939	a	57	++++	++++	++++	++++	++++	++++	Died.
35	Dr. J. D. Reid	C	62	Richmond, Va.		Sept. 1939	a	11+	++++	++++	++++	+++	++	±	Do.
36	Do.	C	18	do.	Market, picking chickens.	Sept. 1939	a b	18+ 23	++++ ++++	+++ ++++	+++ ++++	0 ++++	0 +	0 ±	Recovered.
37	Do.	C	56	do.	Pump operator	Feb. 1940	b	48	++++	++++	++++	++++	++++	++++	Do.
38	Do.	W	34	do.	Junk dealer	July 1940	a b	6 19	++ ++++	0 ++++	0 ++++	0 ++++	0 ++++	0 ++++	Do.
39	Drs. G. P. Heffner and T. H. Hutchinson.	W	(1)	Belle, W. Va.	Gardener, laborer	July 1938	c	49	++++	++++	++++	++++	++++	++++	Do.
40	Dr. W. Putschar	W	60	Charleston, W. Va.	Loader in coal mine	Sept. 1939	a	10±	++++	++++	+++	0	0	0	Do.

[1] Adult.
[2] Exact number of days following onset not available, probably 2 to 6 weeks.
[3] Post-mortem serum.
[4] Short illness.

Case 1 was in the service of Dr. Francis G. Blake, professor of internal medicine, School of Medicine, Yale University, New Haven, Conn.

Cases 7, 8, 9, and 10 were in the service of Dr. Warfield T. Longcope, professor of medicine, Johns Hopkins University, Baltimore, Md.

Cases 30, 31, 32, and 33 were in the service of Dr. H. A. Blankenhorn, professor of internal medicine, University of Cincinnati, Cincinnati, Ohio.

The sample of urine from Case 39 collected 29 days following onset of illness gave strong agglutination with *Leptospira icterohaemorrhagiae*. The titer, however, was very low (1:100).

Remarks. During 1937, 1938, and 1939 several outbreaks of infectious jaundice ("infectious hepatitis") occurred in the United States. The writer was sent to study 3 of these outbreaks, 1 in the State of Michigan involving over 300 cases, 1 in Windber, Pa. (a mining town), where over 200 cases occurred, and a third in Austin, Minn. Most of the cases in both Michigan and Pennsylvania were among school children of both sexes ranging from 4 to 23 years of age. Only a few cases occurred in adults (24 to 55 years), while in Austin, Minn., about 10 percent of all the cases were among adults. The writer was unable to demonstrate *Leptospira* in either the 39 samples of urine or the 82 samples of blood from cases from these localities either by animal inoculation tests or by cultural and direct microscopic examinations. Similarly, samples of blood serum from all these cases failed to agglutinate with type I *Leptospira icterohaemorrhagiae*.

Sera from 2 cases of acute yellow atrophy of the liver failed to agglutinate with type I *Leptospira icterohaemorrhagiae* even in very low dilutions (1:10). Control sera of 85 individuals (normal and syphilitic) likewise failed to agglutinate *Leptospira icterohaemorrhagiae* even in very low dilutions such as 1:10.

It was noted that some samples drawn from a given patient in the early stage of the disease gave a relatively low agglutination titer with antigen of type I *Leptospira icterohaemorrhagiae* when compared with subsequent samples drawn 6 to 27 days later, which ran to much higher titers. For example, in the first blood sample drawn from patient No. 4 about 9 days following onset the agglutination titer was 1:3,000, while the second sample from the same patient drawn 15 days after the onset gave a titer of 1:10,000. (See tables 1 and 2, cases 1, 3, 4, 15, 22, 36, and 38.)

Delayed and partial agglutination reactions with type I *Leptospira*, in low dilutions, were obtained in 8 additional cases not included in table 1.

The remaining 494 samples representing 481 clinically suspected cases of epidemic and sporadic infectious jaundice ("infectious hepatitis") or Weil's disease, 2 cases of acute yellow atrophy of the liver, and 1 suspected case of yellow fever from the United States failed to agglutinate with type I *Leptospira icterohaemorrhagiae*. In addition, control serum specimens from 85 individuals, normal and syphilitic, likewise failed to agglutinate type I *Leptospira*, even in very low dilutions such as 1:30.

After the original tests a total of 61 serum specimens from 36 cases of the present group were stored in the refrigerator. These 61 samples were then retested at from 169 to 1,078 days later with the antigen of type I *Leptospira icterohaemorrhagiae* for agglutination reactions. All these samples, with the exception of 4 delayed reactions (cases 20a, 21a, 24a, and 28a), gave prompt and complete agglutination reactions; the titers of the majority of the samples approached or were identical with the original titer. Table 2 gives representative reactions for 28 of the 61 serum specimens.

Direct microscopic examination of the patients' blood.—Direct microscopic examination with dark-field illumination of the blood specimens from cases 7, 8, 11, 17, 18, 23, 25, 28, and 39 gave negative results for *Leptospira*. In addition to these 9 cases, blood specimens collected from 39 cases of infectious jaundice ("infectious hepatitis") were similarly examined with negative results. The hyaline blood filaments and blood fibers, which often resemble *Leptospira* morphologically, were frequently met with and eliminated as such. The physician attending case 27 stated that his technician was able to demonstrate *Leptospira* in the blood and urine of this case microscopically by dark-field illumination.

Animal inoculation tests.—Defibrinated blood specimens from cases 7, 8, 11, 17, 18, 23, 25, 28, and 39 inoculated into young guinea pigs and deer mice, *P. m. gambelii* (*17*, *18*), all gave negative results for *Leptospira icterohaemorrhagiae*. The physicians attending cases 14, 15, 23, 29, 35, and 38 state that they were able to isolate *Leptospira*

TABLE 2.—*The Storage of some positive serum samples from human cases of Weil's disease and the retesting of their agglutination reactions with type I Leptospira icterohaemorrhagiae*

Case No.	Number of sample from each case	Date sample received	Date sample obtained from patient	Number days sample in ice-box storage at about 5° C.	Agglutination reaction, dilution of serum							
					1:10	1:30	1:100	1:300	1:1,000	1:3,000	1:10,000	1:30,000
1	b	Dec. 29, 1939	Dec. 27, 1939	292	+++	+++	++++	++++	++++	++++	++++	++++
2	a	Aug. 29, 1939	Aug. 29, 1939	414	+++	++++	++++	++++	++++	++++	++++	++++
3	a	Aug. 18, 1939	Aug. 9, 1939	425	++++	++++	+++	++	0	0	0	0
	b	Sept. 5, 1939	Aug. 31, 1939	407	++++	++++	+++	++++	++++	++++	++++	++
4	b	Sept. 22, 1939	Sept. 15, 1939	390	ppt	ppt	ppt	++++	++++	+++	++	0
5	a	Dec. 27, 1939	Oct. 31, 1939	±300	++++	+++	+++	++	0	0	0	0
6	a	May 1, 1940	Apr. 6, 1940	169	++++	++++	++++	++++	++++	++++	++++	++++
7	b	Dec. 2, 1937	Nov. 30, 1937	1,052	++++	++++	++++	++++	+++	+	0	0
8	a	Nov. 4, 1937	Nov. 2, 1937	1,078	++++	++++	++++	++++	++++	++++	++++	+
9	b	June 22, 1938	June 8, 1938	847	++++	++++	++++	++++	++	0	0	0
10	c	Aug. 20, 1938	Aug. 19, 1938	804	++++	++++	++++	++++	++++	++++	++++	++++
12	a	Nov. 15, 1939	(1)	336	ppt	ppt	++++	++	0	0	0	0
13	a	Oct. 3, 1939	Sept. 30, 1939	379	ppt	++++	++++	++++	++++	++++	0	0
16	d	Sept. 16, 1938	Sept. 2, 1938	762	ppt	++++	++++	++++	++++	++++	++++	++++
19	a	Sept. 27, 1939	----------	383	+++	+++	+++	++	0	0	0	0
21	a	Mar. 15, 1938	Mar. 12, 1938	946	0	0	0	0	0	0	0	0
22	a	Aug. 3, 1938	Aug. 1, 1938	805	++++	+++	++	++	0	0	0	0
	b	Sept. 30, 1938	Sept. 24, 1938	747	++	++++	++++	++++	++++	++++	++++	++++
24	c	Dec. 11, 1939	Nov. 22, 1939	310	+++	++++	++++	++++	++++	++++	++++	++++
25	b	Nov. 12, 1937	Oct. 20, 1937	1,069	++++	++++	++++	++++	++++	++++	++++	++++
	e	Mar. 21, 1938	Mar. 16, 1938	940	ppt	ppt	+++	+++	++++	++	0	0
27	a	Aug. 3, 1938	July 29, 1938	805	++++	++++	++++	++++	++++	+++	+++	+++
29	a	Nov. 16, 1939	Sept. 27, 1939	384	+++	+++	+++	0	0	0	0	0
30	a	July 20, 1939	July 18, 1939	454	ppt	ppt	+++	++++	++++	++++	++++	++++
34	a	Sept. 22, 1939	Sept. 15, 1939	390	++++	+++	++++	++++	++++	++++	++++	++++
35	a	Sept. 18, 1939	Sept. 15, 1939	394	ppt	ppt	++++	++++	++++	+++	+	0
39	c	July 22, 1938	July 18, 1938	817	++++	++++	++++	++++	++++	++++	++++	+++
40	a	Sept. 22, 1939	Sept. 20, 1939	390	++++	++++	++++	++++	+++	0	0	0

[1] Post-mortem serum.

NOTE.—The readings recorded above were made after 2 hours. Serum No. 21a was negative at 2 hours but gave a delayed reaction after 18 hours' observation.

icterohaemorrhagiae from the urine of their patients by animal inoculation methods.

The specimens of urine from case 39 collected 29 days following onset of illness likewise gave negative results for *Leptospira* by animal inoculation tests, although in the urine of this case agglutinins for *Leptospira* were present in low dilution (1:100).

During outbreaks of infectious jaundice in Michigan, Pennsylvania, and Minnesota the 82 specimens of blood and 39 specimens of urine collected from the group of 82 cases at various stages of illness (from about 2 to 30 days after onset) were likewise inoculated into susceptible test animals, with negative results for *Leptospira icterohaemorrhagiae*.

The susceptible animals inoculated with the kidney suspension from wild rats (*Rattus norvegicus*) captured in Washington, D. C., Detroit, Mich., and New York City succumbed to icterohemorrhagic spirochetosis.

Clinical data.—The manifestations of the disease ranged from all degrees of mildness to marked severity. Case 10 presented no apparent external jaundice. Most of the patients, however, suffered severe illness extending over a period of from 1 to 7 weeks. Of this series of 40 persons, 6 died.

The chief clinical symptoms recorded for the cases giving positive agglutinations were described, in general, as malaise, initial chill, sudden onset of high fever, headache, muscular pain, prostration, nausea, vomiting, icterus, epistaxis, and hemoptysis. A few of the case histories mentioned hiccoughing, photophobia, and mental disturbances. The chief laboratory findings consisted of leucocytosis (average 20,000 white blood cells per cubic millimeter), increased icterus index, increased nonprotein nitrogen of blood, albuminuria, urobilinuria, and, occasionally, hematuria.

Epidemiological data.—The 40 cases which gave strongly positive agglutination reactions for Weil's disease were sporadic in various States. (See table 1.) Of these, 36 cases occurred in adult males, 1 in an adult female (case 12), and 3 in school children. Of the 40 cases, 8 were in colored persons, the remaining in white persons.

One of the striking features, as seen in table 1, is the similarity in the occupations of these patients. The data available on 30 of the 40 cases indicate that all had lived, or worked, in places where wild rats might have been present, and where working conditions were conducive to skin abrasions.

Data pertaining to reservoir hosts of Weil's disease.—Virulent strains of *Leptospira icterohaemorrhagiae* were isolated by animal inoculation and cultural methods from the kidneys of wild rats (*Rattus norvegicus*) captured in Washington, D. C., Detroit, Mich., and New York City. These rats, which apparently were chronic carriers of *Leptospira*,

showed agglutinins present in their blood, titers ranging from 1:1,000 to 1:10,000. It is noteworthy that in New York City the infected rats were captured in a fish market where cases 25 and 26 apparently contracted the infection.

Blood samples from 25 dogs suffering from jaundice were likewise subjected to agglutination tests with type I *Leptospira icterohaemorrhagiae*. Of this number, 20 gave strong agglutination reactions with type I *Leptospira*. In most of these cases titers were as high as 1:30,000. These cases occurred in Louisiana, Nebraska, New York, Pennsylvania, and Virginia. One of the dogs, belonging to patient 6, contracted the infection at about the same time as did his owner.

DISCUSSION

For absolute diagnosis of Weil's disease it is essential to isolate the organism *L. icterohaemorrhagiae* from the patient's blood or urine by cultural and animal inoculation tests; this, however, must be done with freshly collected specimens in the early stage of the disease. *Leptospira* rarely can be found in the blood of human cases after 5 days and in the urine after a month following onset of illness.

Since the 9 specimens from the 40 cases which were examined for spirochetes were received after this period, or were stored in the ice box several days before they were examined, the failure to isolate organisms was possibly due to these factors. In specimens from the 82 cases encountered during epidemics of jaundice in which material was obtained at a sufficiently early stage of illness to expect positive results, and where animals were inoculated with this material within 2 to 5 hours, the failure to isolate *Leptospira icterohaemorrhagiae*, coupled with negative agglutination tests, suggests that these cases were possibly not classical cases of Weil's disease but were what is known as epidemic jaundice ("infectious hepatitis").

While *L. icterohaemorrhagiae* are readily demonstrable by microscopic search with dark-field illumination in the circulating blood of susceptible animals experimentally inoculated with virulent strains of *Leptospira*, it is difficult to demonstrate them in the blood of human cases diagnosed as suffering from Weil's disease. Few investigators (*11*, *12*) claim to have seen large numbers of *Leptospira* in the blood of patients by direct microscopic examination. The utmost precaution must be exercised not to confuse blood filaments and fibers with *L. icterohaemorrhagiae*. For this reason it is desirable to run agglutination tests with the blood serum of all suspected or questionable cases of Weil's disease, in addition to other clinical and laboratory procedures.

The inoculation of susceptible animals with patient's blood (during the third to fifth day of illness) or urine (from 10 to 30 days following onset), or both, should be done in the very early stages of the disease

as indicated above, using American deer mice (albino *Peromyscus maniculatus*), young *Peromyscus eremicus* (*16, 17, 18*), and young albino guinea pigs. When an inoculated animal fails to die and *Leptospira* are not demonstrable in its blood at the end of the third week, its heart blood should be tested for the presence of agglutinins and lysins, and, whenever convenient, other young guinea pigs should be inoculated with the kidney suspension from sacrificed animals (*23*).

The agglutination test, when positive, is of great value in the diagnosis of Weil's disease. On the other hand, negative findings do not exclude the disease. In the early, or incipient, cases of Weil's disease in man specific antibodies may be absent, or present in such minute quantities that they cannot be demonstrated with present methods. However, antibodies are detectable in the circulating blood about 7 days following onset of illness. The quantity increases during the following 8 to 30 days. After the recovery of the patient the specific antibodies are present in the blood for at least 5 years or longer (*20*).

SUMMARY

1. During the past 4 years, using the microscopic agglutination test, the writer has found agglutinins for type I *Leptospira icterohaemorrhagiae* in the sera of 40 suspected cases of Weil's disease.

2. These cases occurred in the following States: Connecticut (1), Louisiana (4), Maryland (9), Massachusetts (2), Michigan (2), Missouri (2), Nevada (1), New Jersey (2), New York (5), Ohio (4), Pennsylvania (1), Virginia (4), West Virginia (2), and in the District of Columbia (1).

3. Thirty-six cases occurred in adult males, 1 in an adult female, and 3 in children. The occupation or place of residence of most of these cases was such that contact with wild rats might be expected. Eight of the 40 cases were in colored persons, the others in white persons.

4. Of the 40 cases, 6 terminated fatally.

5. With the freshly prepared formalinized antigen of type I *Leptospira icterohaemorrhagiae* the agglutination titer of 5 cases ranged from 1:300 to 1:1,000; in eight cases the titers ranged from 1:3,000 to 1:10,000; the remaining 27 cases each gave a titer of about 1:30,000 or higher. The agglutination reactions in these dilutions were prompt and completed within 2 hours.

6. Sixty-one blood samples from 36 human cases of Weil's disease, after storage in the refrigerator at 5° C. from 169 to 1,078 days, were retested and, with 4 exceptions, were found to give strong agglutination reactions with type I *Leptospira icterohaemorrhagiae*. The agglutination titers of this group approached, or were identical with, the original agglutination titers.

7. Blood samples from 20 jaundiced dogs (from Louisiana, Nebraska, New York, Pennsylvania, and Virginia) likewise gave strong agglutination reactions with type I *Leptospira icterohaemorrhagiae* in dilutions of 1:30,000 and higher.

8. Virulent strains of *Leptospira icterohaemorrhagiae* were isolated from wild rats (*Rattus norvegicus*) captured in Detroit, Mich., in New York City, and in Washington, D. C.

REFERENCES

(*1*) Ball, H. A.: Leptospiral jaundice. Am. J. Clin. Path., **3**: 283 (1933).
(*2*) Bates, J. E.: Leptospirosis icterohaemorrhagica (Weil's disease). Canad. Med. Assoc. J., **16**: 1466 (1926).
(*3*) Brown, H. C.: Serological diagnosis of Weil's disease. Brit. Med. J., **1**: 411 (1935).
(*4*) Cushing, E. H.: Leptospirosis icterohemorrhagica. J. Am. Med. Assoc., **89**: 1041 (1927).
(*5*) Davidson, L. S. P., and Smith, J.: Weil's disease in fishworkers. Quarterly J. Med., **5**: 263 (1936).
(*6*) Elton, N. W.: Spirochetal jaundice in Buffalo, New York. Am. J. Clin. Path., **9**: 219 (1939).
(*7*) Fairley, N. H.: Weil's disease among sewer workers in London. Brit. Med. J., **2**: 10 (1934).
(*8*) Gaines, A. R., and Johnson, R. P.: Weil's disease. Report of seven cases. Arch. Int. Med., **60**: 817 (1937).
(*9*) Glotzer, S.: Weil's disease. Report of a case in a fish worker. J. Am. Med. Assoc., **110**: 2143 (1938).
(*10*) Haschec, W., and Tobey, F. J.: A case of Weil's disease. J. Am. Med. Assoc., **113**: 1319 (1939).
(*11*) Jeghers, H. J., Houghton, J. D., and Foley, J. A.: Weil's disease. Report of a case with postmortem observations and review of recent literature. Arch. Path., **20**: 447–476 (1935).
(*12*) Little, O. W.: Spirochetosis icterohaemorrhagica. Report of three cases. Texas State Med. J., **32**: 305 (1936).
(*13*) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Epidemiology of leptospirosis. Am. J. Pub. Health, **29**: 347 (1939).
(*14*) Molner, J. G., and Kasper, J. A.: An outbreak of jaundice in Detroit. J. Am. Med. Assoc., **110**: 2069 (1938).
(*15*) Packchanian, A.: The occurrence of *Leptospira icterohaemorrhagiae* and *Spirochaeta morsus muris* in "laboratory white mice" *Mus musculus* at St. Louis (1933) and extreme susceptibility and fatality of American deer mice (*Peromyscus*) to *Leptospira icterohaemorrhagiae*. Science N. S., **83**: 2350 (1936). Pub. by title.
(*16*) Packchanian, A.: La Spirochetose icterohémorragique (Maladie de Weil) aux Etats-Unis. Bull. Off. Internat. d'Hyg. Pub., **29**: 2350 (1937).
(*17*) Packchanian, A.: The prevalence of infectious jaundice in the United States as determined by agglutination and animal inoculation tests. Am. J. Path., **14**: 638 (1938).
(*18*) Packchanian, A.: Susceptibility and resistance of certain species of American deer mice, genus *Peromyscus*, and other rodents to *Leptospira icterohaemorrhagiae*. Pub. Health Rep., **55**: 1389 (1940).
(*19*) Schüffner, W.: Versuch der Vereinfachung der Serodiagnostik bei Weilscher Krankheit. Arch. f. Schiffs. u. Trop. Hyg., **36**: 239 (1932).
(*20*) Schüffner, W.: Recent work on leptospirosis. Tr. Roy. Soc. Trop. Med. and Hyg., **28**: 7 (1934).
(*21*) Sellards, A. W.: The interpretation of (*?Spirochaeta*) *interrogans* of Stimson (1907) in the light of subsequent developments. Trans. Roy. Soc. Trop. Med. and Hyg., **33**: 545 (1940).
(*22*) Stimson, A. M.: Note on an organism found in yellow fever tissues. Pub. Health Rep., **22**: 541 (1907).
(*23*) Stimson, A. M.: A brief history of bacteriological investigations of the United States Public Health Service. Supplement No. 141 to the Public Health Reports. (Government Printing Office, Washington, D. C., **1938**.)

(24) Syverton, J. T., Berry, G. P., and Stiles, W. W.: The diagnosis of Weil's disease (infectious jaundice). Concerning the use of guinea pigs for the detection of strains of *Leptospira icterohaemorrhagiae* of low virulence. J. Clin. Invest., 17: 522 (1938).
(25) Towler, H., and Walker, J. E.: Spirochetal jaundice. J. Am. Med. Assoc., 89: 86 (1927).
(26) Ridlon, J. R.: Studies on *Leptospira icterohaemorrhagiae*. Pub. Health Rep., 46: 1 (1931).
(27) Roos, C. J., Walch-Sorgdrager, B., and Schüffner, W. A. P.: Ben epidemie van L. canicola infectie bij Menschen en Honden. Nederl. tijdschr. v. geneesk., 81: 3324 (1937).
(28) Wadsworth, A. B., Langworthy, V. H., Stewart, C. F., Moore, A. C., and Coleman, M. B.: Infectious jaundice occurring in New York State. J. Am. Med. Assoc., 78: 1120 (1922).
(29) Weil, A.: Ueber eine eigentümliche, mit Milztumor, Ikterus und Nephritis, einhergehende akute Infektionskrankheit. Deutsch. Arch. Klin. Med., 39: 209 (1886).
(30) Wenyon, C. M.: Protozoology. Vol. 2, p. 1276. Wm. Wood and Co., New York, 1926.
(31) Blake, Francis G.: Weil's disease in the United States. New Eng. J. Med., 223: 561–564 (1940).

DIRECTORY OF STATE AND INSULAR HEALTH AUTHORITIES, 1941

The present directory lists only the personnel holding major administrative posts, i. e., chiefs of departments, divisions, bureaus, and special activities. Members of the board of health, other than the health officer, are not included.

The information has been collected from the State and insular health officers as of September 1, 1941. An asterisk (*) is used to indicate the fact that an officer has been reported to be a part-time employee. All periodicals and regular publications that were reported are listed.

ALABAMA STATE BOARD OF HEALTH

Montgomery

Administration:
J. N. Baker, M. D., State health officer.
Douglas L. Cannon, M P. H., M. D., assistant in administration.
Hygiene and Nursing, Bureau of:
B. F. Austin, M. D., director.
Laboratories, Bureau of:
S. R. Damon, Ph. D., director.
Preventable Diseases, Bureau of:
D. G. Gill, D. P. H., M. D., director.
Sanitation, Bureau of:
D. S. Abell, M. S. in S. E.
Vital Statistics, Bureau of:
L. V. Phelps, S. B. in P. H., director.
Publications:
Vital Statistics Bulletin—monthly.
Report of State Board of Health—yearly.
Report of Bureau of Vital Statistics—yearly.

ALASKA TERRITORIAL DEPARTMENT OF HEALTH

Juneau

Commissioner of Health:
*W. W. Council, B. S., M. D.
Courtney Smith, A. B., M. D., Dr. P. H., assistant commissioner of health.
Communicable Disease Control, Division of:
Courtney Smith, A. B., M. D., Dr. P. H., director.
John I. Weston, B. S., Ph. C., M. D., tuberculosis clinician.
Maternal and Child Health and Crippled Children, Division of:
Wayne S. Ramsey, A. B., M. D., director
Public Health Engineering, Division of:
Kaarlo W. Nasi, B. S. E., director.
Public Health Laboratories, Division of:
Warren C. Eveland, A. B., M. S. P. H., director.
Public Health Nursing, Division of:
Mary K. Cauthorne, R. N., advisory nurse.

ARIZONA STATE DEPARTMENT OF HEALTH

Phoenix

Superintendent of Public Health:
- **G. F. Manning, M. D.**
- J. D. Dunshee, M. D., assistant.

Health Education:
- Frank Williams, B. A., M. S. P. H., supervisor.

Laboratories:
- Mildred T. Wooley, D. P. H., director.

Local Health Administration:
- J. D. Dunshee, M. D., director.

Maternal and Child Health:
- Hilda Kroeger, M. D., director.

Nursing:
- Jefferson I. Brown, R. N., C. P. H. in Nursing, director.

Sanitary Engineering:
- George Marx, B. S., C. E., director.

Vital Statistics:
- Florence Olsen, B. A., statistician.

ARKANSAS STATE BOARD OF HEALTH

Little Rock

State Health Officer:
- **W. B. Grayson, B. S., M. D., F. A. C. P.**
- T. T. Ross, M. D., M. P. H., assistant State health officer.

Communicable Disease Control, Division of:
- A. M. Washburn, M. D., M. P. H., director.

Dairy Products, Division of:
- C. O. Jacobson, B. S., Dairying, M. S., Dairy Manufacturers, director.

Dental Hygiene, Subdivision of:
- R. P. Spurlin, Jr., D. D. S., director.

Laboratories, Bureau of:
- H. V. Stewart, M. D., director.

Local Health Service, Bureau of:
- T. T. Ross, M. D., M. P. H., director.

Malaria Investigations, Division of:
- John Taylor, acting director.

Maternal and Child Health, Division of:
- W. Myers Smith, M. D., M. P. H., director.

Milk Control, Division of:
- D. W. Jones, B. S. in Agriculture, director.

Nursing:
- Margaret Vaughan, R. N., B. S. in P. H. N., supervisor of nurses.

Sanitary Engineering, Bureau of:
- Walter A. Reiman, B. S., C. E., acting director.

Tuberculosis Control, Subdivision of:
- H. Lee Fuller, M. D., director.

Venereal Disease Control, Subdivision of:
- D. W. Dykstra, M. D., M. P. H., director.

Vital Statistics, Bureau of:
- Mrs. J. B. Collie, director.

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH

Sacramento

Administration:
- **Bertram P. Brown, M. D.**, director.
- Edward E. Johnson, assistant to the director.

Cannery Inspection, Bureau of:
- Milton P. Duffy, Ph. C., chief.

Child Hygiene, Bureau of:
- Ellen S. Stadtmuller, M. D., chief.

County Health Work, Bureau of:
- George M. Uhl, M. D., chief.

Crippled Children's Services:
- C. Martin Mills, M. D., chief.

Epidemiology, Bureau of:
- Harlin L. Wynns, M. D., chief.

Food and Drug Inspection, Bureau of:
- Milton P. Duffy, Ph. C., chief.

Industrial Hygiene Services:
- John P. Russell, M. D., chief.

Public Health Nursing Services:
- Rena Haig, P. H. N., chief.

Sanitary Engineering, Bureau of:
- Chester G. Gillespie, C. E., chief.

Sanitary Inspections, Bureau of:
- Edward T. Ross, chief.

Tuberculosis, Bureau of:
- Edythe T. Thompson, A. B., chief.

Venereal Diseases, Bureau of:
- Malcolm H. Merrill, M. D., chief.

Vital Statistics, Bureau of:
- Marie B. Stringer, M. S., State registrar.

Publications:
- California State Department of Public Health—weekly.
- California State Department of Public Health—biennially.

COLORADO STATE DIVISION OF PUBLIC HEALTH

Denver

Administration:
 R. L. Cleere, M. D., M. P. H., secretary and executive officer.
Crippled Children, Division of:
 Maurice D. Vest, M. D., M. P. H., director.
Dental Health, Subdivision of:
 Robert A. Downs, D. D. S., M. P. H., director.
Food and Drugs, Division of:
 Kenneth W. Lloyd, Ph. R., commissioner.
Industrial Hygiene, Subdivision of:
 Robert J. Owens, B. A., director.
Laboratories, Division of:
 Frances McConnell, M. D., director.
Maternal and Child Health, Division of:
 J. Burris Perrin, M. D., C. P. H., director.
Plumbing, Division of:
 Irving A. Fuller, chief plumbing inspector.
Public Health Nursing, Division of:
 Mary H. Emberton, R. N., B. S., director.
Rural Health Work and Epidemiology, Division of:
 L. J. Lull, M. D., M. P. H., acting director.
Sanitary Engineering, Division of:
 Benjamin V. Howe, B. S., director.
Tuberculosis Control, Division of:
 Alfred R. Masten, M. D., M. P. H., director.
Venereal Disease Control, Division of:
 L. J. Lull, M. D., M. P. H., director.
Vital Statistics, Division of:
 Frank S. Morrison, LL. B., director.
Publications:
 Colorado State Board of Health Bulletin—bimonthly.
 Report of Colorado State Division of Public Health—biennially.

CONNECTICUT STATE DEPARTMENT OF HEALTH

Hartford

State Commissioner of Health:
 Stanley H. Osborn, M. D., C. P. H.
Accounts and Supplies, Division of:
 Lawrence A. Fagan, chief.
Cancer Research, Division of:
 Matthew H. Griswold, M. D., Dr. P. H., chief.
Child Hygiene, Bureau of:
 Martha L. Clifford, M. D., C. P. H., director.
Crippled Children, Division of:
 Louis Spekter, M. D., chief.
Dental Hygiene, Division of:
 Franklin M. Erlenbach, D. M. D., chief.
Industrial Hygiene, Bureau of:
 Albert S. Gray, M. D., director.
Laboratories, Bureau of:
 Friend Lee Mickle, M. S., Sc. D., director.
Licensure and Registration, Division of:
 Ruth H. Monroe, chief.
Local Health Administration, Division of:
 Henry R. O'Brien, M. D., M. P. H., chief.
Mental Hygiene, Bureau of:
 James M. Cunningham, M. D., director.
Preventable Diseases, Bureau of:
 Millard Knowlton, M. D., C. P. H., director.
Public Health Instruction and Nutrition, Bureau of:
 Elizabeth C. Nickerson, B. S., C. P. H., director.
Public Health Nursing, Bureau of:
 Hazel V. Dudley, R. N., B. S., director.
Sanitary Engineering, Bureau of:
 Warren J. Scott, S. B., director.
Venereal Diseases, Bureau of:
 Henry P. Talbot, M. D., M. P. H., director.
Vital Statistics, Bureau of:
 William C. Welling, B. A., director.
Publications:
 Weekly Health Bulletin.
 Connecticut Health Bulletin—monthly.
 Annual Report of State Department of Health.
 Annual Vital Statistics Report.

DELAWARE STATE BOARD OF HEALTH

Dover

Executive Officer:
 Edwin Cameron, M. D., C. M., M. P. H.
Communicable Disease Control, Division of:
 Joseph R. Beck, M. D., director.
Maternal and Child Health:
 Floyd I. Hudson, M. D., director.
Pathological and Bacteriological Laboratory:
 R. D. Herdman, B. S., bacteriologist.
Sanitation Division:
 R. C. Beckett, B. S. in S. E., State sanitary engineer.
Vital Statistics.
 Edwin Cameron, M. D., C. M., M. P. H., State registrar.
Publications:
 Morbidity Report—weekly.
 Delaware Health News—quarterly.
 Annual Report.

DISTRICT OF COLUMBIA HEALTH DEPARTMENT

Washington

Administration:
- **George C. Ruhland, M. D.,** health officer.
- Daniel L. Seckinger, M. D., Dr. P. H., assistant health officer and coordinator of health and hospitals.

Food Inspection, Bureau of:
- Reid R. Ashworth, D. V. S., director.

Laboratories, Bureau of:
- John E. Noble, B. S., acting director.

Maternal and Child Welfare:
- Ella Oppenheimer, M. D., director.

Medical and Sanitary Inspection of Schools:
- Joseph A. Murphy, M. D., director.

Nursing, Bureau of:
- Josephine Pittman Prescott, A. M., P. H. N., Certf., director.

Permit Bureau:
- Richard F. Tobin, M. D., director.

Pharmacist.
- Thomas F. Donohue.

Public Health Instruction, Bureau of:
- Melvin P. Isaminger, Dr. P. H., director.

Preventable Diseases, Bureau of:
- James G. Cumming, M. D., director.

Sanitation, Bureau of:
- J. Frank Butts, director.

Tuberculosis, Bureau of:
- *A. Barklie Coulter, M. D., director.

Vital Statistics, Bureau of:
- Joseph B. Irvine, LL. M., director.

Publications:
- Monthly report by health department.
- Monthly statement of average grade of milk and ice cream sold.
- Annual report by health officer

FLORIDA DEPARTMENT OF PUBLIC HEALTH

Jacksonville

State Health Officer:
- **W. H. Pickett, M. D., C. P. H.,** director.
- J. N. Patterson, M. S., M. D., assistant director.

Accounting:
- G. Wilson Baltzell, director.

Dental Health:
- Lloyd N. Harlow, director.

Engineering:
- David B. Lee, M. S. in S. E

Entomologist:
- W. V. King. Ph. D., director.

Epidemiology:
- Harry B. Smith, M. D., director.

Health Education:
- Elizabeth Bohnenberger, director.

Laboratories:
- J. N. Patterson, M. D., director.

Local Health Service:
- A. W. Newitt, M. D., director.

Malaria Research:
- Mark F. Boyd, M. D., director.

Malariologist:
- John E. Elmendorf, Jr., M. D., director

Maternal and Child Health:
- W. H. Ball, M. D., director.

Narcotics:
- M H. Doss, director.

Public Health Nursing:
- Ruth E. Mettinger, R. N., director.

Public Relations Consultant:
- Joan Henderson, director.

Tuberculosis:
- Lynne E. Baker, M. D., director.

Venereal Disease Control:
- L. C. Gonzalez, M. D., director

Publications:
- Florida Health Notes—monthly.

GEORGIA DEPARTMENT OF PUBLIC HEALTH

Atlanta

Director:
- **T. F. Abercrombie, M. D., D. P. H.**

Dental Health Education, Division of:
- *J. G. Williams, D. D. S., director.

Information and Statistics, Division of:
- D. M. Wolfe, M. D., D. P. H., director.

Laboratories, Division of:
- T. F. Sellers, M. D., director.

Local Health Organization, Division of:
- G. G. Lunsford, M. D., director.

Malaria and Hookworm Service, Division of:
- Justin Andrews, Sc. D., director.

Maternal and Child Health, Division of:
- Joe P. Bowdoin, M. D., director.

Preventable Diseases, Division of:
- C. D. Bowdoin, M. D., D. P. H., director.

Public Health Education, Division of:
- R. V. Schultz, M. D., director.

Public Health Engineering, Division of:
- L. M. Clarkson, director.

Public Health Nursing, Division of:
- Mrs. Abbie R. Weaver, R. N., director.

Tuberculosis Control, Division of:
- H. C. Schenck, M. D., director.

Publications:
- Georgia's Health—monthly.

TERRITORY OF HAWAII BOARD OF HEALTH

Honolulu, T. H.

Territorial Commissioner of Public Health:
- **M. F. Haralson, M. D.**
- Richard K. C. Lee, M. D., Dr. P. H., deputy territorial commissioner of public health.
- Alexander MacDonald, B. J., director of public health education.

Communicable Diseases, Bureau of:
- James R. Enright, M. D., B. A., director.

Crippled Children, Bureau of:
- Richard K. C. Lee, M. D., Dr. P. H., director.

Maternal and Child Health, Bureau of:
- Charles L. Wilbar, Jr., A. B., M. D., director.

Mental Hygiene, Bureau of:
- Edwin E. McNiel, M. D., A. B., director.

Public Health Nursing, Bureau of:
- Mary Williams, B. S., P. H. N., director.

Pure Food and Drugs, Bureau of:
- M. B. Bairos, A. B., director.

Sanitation, Bureau of:
- S. W. Tay, B. S., director.

Tuberculosis, Bureau of:
- C. Alvin Dougan, M. D., B. A., director.

Venereal Disease Control:
- *Harold M. Johnson, Ph. C., B. S., M. D., clinic physician.

Vital Statistics, Bureau of:
- Andrew S. Wong, B. S., M. P. H., acting registrar general.

Publications:
- Annual Report, Board of Health, Territory of Hawaii.
- Monthly Bulletin, "Hawaii Health Messenger."

IDAHO DEPARTMENT OF PUBLIC HEALTH

Boise

Administration, Division of Public Health:
- **E. L. Berry, M. D., M. S. P. H., director.**

Industrial Hygiene, Bureau of:
- H. C. Clare, B. S., Chem. E., M. S., M. S. Eng., director.

Laboratories, Division of:
- L. J. Peterson, M. S. P. H., director.

Local Health Service, Epidemiology and Venereal Diseases, Division of:
- C. H. Mann, M. D., Dr. P. H., director.

Maternal and Child Health and Crippled Children, Division of:
- Ruth J. Raattama, M. D., director.

Public Health Nursing, Division of:
- Edith Carr, R. N., P. H. N., B. S., director.

Sanitary Engineering, Division of:
- W. V. Leonard, B. S., M. E., director.

Vital statistics, Bureau of:
- Mabel Elder, director.

ILLINOIS STATE DEPARTMENT OF PUBLIC HEALTH

Springfield

Director:
- **Roland R. Cross, M. D.**

Senior Administrative Officer:
- Baxter K. Richardson, A. B.

Cancer Control, Division of:
- R. V. Brokaw, M. D., chief.

Communicable Diseases, Division of:
- J. J. McShane, M. D., Dr. P. H., chief.

Community Sanitation, Section of:
- Harry William Weeks, assistant State director.

Dental Health Education, Division of:
- C. F. Deatherage, D. D. S., M. P. H., chief.

Industrial Hygiene, Division of:
- M. H. Kronenberg, M. D., B. S., chief.

Laboratories (Diagnostic and Biologic), Division of:
- H. J. Shaughnessy, Ph. D., chief.

Local Health Administration, Division of:
- Hugo V. Hullerman, M. D., M. S. P. H., chief.

Lodging House Inspection, Division of:
- Bernard S. Black, chief.

Maternal and Child Hygiene, Division of:
- Grace S. Wightman, M. D., chief.

Pneumonia Control, Section of:
- Reno Rosi, M. D., control officer.

Public Health Instruction, Division of:
- Leona de Maré East, A. B., chief.

Public Health Nursing, Division of:
- Maude Carson, R. N., chief.

Sanitary Engineering, Division of:
- C. W. Klassen, B. S., chief engineer.

Statistical Research, Section of:
- O. K. Sagen, Ph.D., chief statistician.

Venereal Disease Control, Division of:
- H. M. Soloway, M. D., chief.

Vital Statistics, Division of:
- R. H. Woodruff, M. D., registrar.

Publications:
- Annual Report.
- Manual and Outline of Procedure for Health Officers for the Control of Communicable
- Memorandum to Health Officers—weekly.
- Bulletin of Communicable Disease Report—biweekly.
- Special Reports—quarterly or oftener.
- Illinois Health Messenger—semimonthly.
- Educational Health Circulars—annually.
- Catalog of Educational Materials—semiannually.
- Press Releases—weekly or oftener.
- Radio Broadcasts—weekly (6 months' season).
- Over the Spillway—quarterly.
- The Digester—quarterly.
- Time and Temperature—quarterly.
- The New Swimmin' Hole—quarterly.

INDIANA STATE BOARD OF HEALTH

Indianapolis

Administration:
J. W. Ferree, M. D., M. P. H., director.
Accounting, Bureau of:
Carl F. King, LL. B., administrative assistant.
Bacteriological Laboratory:
*C. G. Culbertson, M. D., chief.
Communicable Diseases, Bureau of:
J.W. Jackson, M. D., B. A., State epidemiologist
Community Sanitation, Bureau of:
Robert Heider, assistant State director.
Dairy Products, Bureau of:
John Taylor, B. S., M. S., chief.
Food and Drugs, Bureau of:
Joseph C. Schneider, A. B., chief.
Health and Physical Education, Bureau of:
*T. B. Rice, M. D., chief.
Industrial Hygiene, Bureau of:
Louis W. Spolyar, M. D., chief.
Legal Administration, Bureau of:
Francis Hamilton, LL. B., deputy attorney general.
Local Health Administration, Bureau of:
George M. Brother, M. D., M. P. H., chief.
Maternal and Child Health, Bureau of:
*Howard B. Mettel, M. D., chief.
Public Health Nursing, Bureau of:
Eva F. MacDougall, R. N., A. B., chief.
Sanitary Engineering, Bureau of:
B. A. Poole, B. S., C. E., chief engineer.
Venereal Diseases, Bureau of:
George W. Bowman, M. D., chief.
Vital Statistics, Bureau of:
H. M. Wright, chief.
Publications:
Monthly Bulletin of the Indiana State Board of Health.
Sewage Gas—quarterly.

IOWA STATE DEPARTMENT OF HEALTH

Des Moines

Administration, Public Health:
Walter L. Bierring, M. D., F. A. P. H. A., F. A. C. P., Hon. R. C. P. Edin., commissioner.
Cancer Control, Division of:
Edmund G. Zimmerer, M. D., M. P. H., director.
Local Health Services:
Marvin F. Haygood, M. D., M. P. H., director.
Maternal and Child Health, Division of:
John M. Hayek, M. D., M. P. H., director.
Preventable Disease, Division of:
Carl F. Jordan, A. B., M. D., M. P. H., director.
Public Health Education, Division of:
Wm. H. Schultz, B. S. in J., director.
Public Health Engineering and Industrial Hygiene, Division of:
A. H. Wieters, B. S., M. S. San. Eng., director.
Public Health Nursing, Division of:
Marie Neuschaefer, R. N., acting director.
State Hygienic Laboratories, Division of:
M. E. Barnes, M. D., Dr. P. H., director.
Tuberculosis Control, Division of:
Charles K. McCarthy, M. D., director.
Venereal Disease Control:
R. M. Sorensen, M. S., M. D., C. P. H., director.
Vital Statistics, Division of:
Eric P. Pfeiffer, M. D., C. P. H., director.
Publications:
Health Message—weekly.
Press releases.
Quarterly and special bulletins.
Biennial reports.

KANSAS STATE BOARD OF HEALTH

Topeka

Secretary and Executive Officer:
F. P. Helm, M. D.
Child Hygiene, Division of:
H. R. Ross, M. D., director.
Communicable Diseases, Division of:
C. H. Kinnaman, M. D., director.
Dental Hygiene, Division of:
Leon R. Kramer, M. P. H., D. D. S., director.
Food and Drugs, Division of:
Evan Wright, acting assistant chief.
Local Health, Division of:
R. F. Boyd, M. D., M. P. H., director.
Public Health Education, Division of:
Bertha Campbell, director.
Public Health Laboratories, Division of:
Chas. H. Hunter, Ph. D., director.
Sanitation, Division of:
Earnest Boyce, M. S., chief engineer
Tuberculosis, Division of:
F. C. Beelman, M. D., director.
Venereal Diseases, Division of:
Robert H. Riedel, M. D., M. P. H., director.
Vital Statistics, Division of:
Minnie Fleming, State registrar
Publications:
Morbidity Report—weekly.
The News Letter—monthly.
Student Accidents—yearly.
Kansas Accidental Deaths—yearly.
The Biennial Report.

KENTUCKY STATE DEPARTMENT OF HEALTH

Louisville

State Health Commissioner:
- **A. T. McCormack, M. D., D. P. H.**
- P. E. Blackerby, M. D., assistant State health commissioner.

Bacteriology, Bureau of:
- Lillian H. South, M. D., director.

Budget, Bureau of:
- Elva Grant, director.

Communicable Diseases, Division of:
- Fred W. Caudill, M. D., C. P. H., director.

County Health Work, Bureau of:
- P. E. Blackerby, M. D., director.

Dental Health, Bureau of:
- *J. F. Owen, D. D. S., director.

Epidemiology, Bureau of:
- Fred W. Caudill, M. D., C. P. H., director.

Foods, Drugs, and Hotels, Bureau of:
- Sarah Vance Dugan, M. S., director.

Maternal and Child Health, Division of:
- C. B. Crittenden, M. D., M. P. H., director.

Mental Hygiene, Bureau of:
- O. M. Goodloe, M. D., C. P. H., acting director.

Public Health Education, Bureau of:
- John W. Kelly, M. A., director.

Public Health Nursing, Bureau of:
- Margaret L. East, R. N., director.

Registration, Bureau of:
- A. T. McCormack, M. D., D. P. H., director.

Sanitary Engineering, Bureau of:
- F. C. Dugan, C. E., director.

Trachoma, Bureau of:
- Robert Sory, M. D., director.

Tuberculosis, Bureau of:
- John B. Floyd, M. D., director.

Venereal Diseases, Bureau of:
- Russell H. Teague, M. D., M. P. H., director.

Vital Statistics, Bureau of:
- J. F. Blackerby, director.

Publications:
- Bulletin, State Department of Health—monthly.
- Service Sifter—monthly.
- Vital Statistics Bulletin—yearly.

LOUISIANA STATE BOARD OF HEALTH

New Orleans

President, State Board of Health:
- **John H. Musser, M. D.**

Administrative Services, Division of:
- S. C. Newitt, chief.

Local Health Service, Division of:
- Ford S. Williams, M. D., chief.

Laboratories, Division of:
- Bacteriological Laboratory:
  - George H. Hauser, M. D.
- Chemical Laboratory:
  - L. C. Andrews.

Preventive Medicine, Division of:
- George M. Leiby, M. D., chief.
  - Crippled Children, Section of:
    - L. C. Spencer, M. D., consultant.
  - Dental Health, Section of:
    - Paul Cook, D. D. S., consultant.
  - Epidemiology, Section of:
    - W. L. Treuting, M. D., consultant.
  - Maternal and Child Health, Section of:
    - Virginia E. Webb, M. D., consultant.
  - Nutrition Services, Section of:
    - Margaret C. Moore, consultant.

Preventive medicine, Div. of—Continued.
  - Tuberculosis Control, Section of:
    - R. Alec Brown, M. D., consultant.
  - Venereal Disease Control, Section of:
    - A. B. Price, M. D., consultant.

Public Health Engineering, Division of:
- John H. O'Neill, chief.
  - Food and Drugs, Section of:
    - J. W. Forbes, consultant.
  - Milk Control, Section of:
    - H. G. McAndrews, consultant.
  - Mosquito Control, Section of:
    - John L. Porter, consultant.
  - Water Supply and Waste Disposal, Section of:
    - F. W. Macdonald, consultant

Public Health Statistics, Division of:
- Lawrence A. Wilson, chief.

Public Relations and Public Health Education:
- J. H. Randolph Feltus.

Publications:
- Morbidity report—weekly.
- Quarterly bulletin.

MAINE DEPARTMENT OF HEALTH AND WELFARE—BUREAU OF HEALTH

Augusta

Director of Health:
- **Roscoe L. Mitchell, M. D.**

Communicable Diseases, Division of:
- R. L. Mitchell, M. D., acting director.

Dental Health, Division of:
- P. W. Woods, D. D. S., M. P. H., director.

Diagnostic Laboratories, Division of:
- A. H. Morrell, M. D., director.

Maternal and Child Health, Division of:
- C. N. Stanhope, M. D., acting director.

Public Health Nursing, Division of:
- Helen F. Dunn, R. N., director.

Sanitary Engineering, Division of:
- E. W. Campbell, D. P. H., director.

Venereal Disease Control, Division of:
- R. P. Jones, M. D.

Vital Statistics, Division of:
- P. B. Stinson, A. B., director.

Publications:
- Vital Statistics Report—yearly.

MARYLAND STATE DEPARTMENT OF HEALTH

Baltimore

Director:
Robert H. Riley, M. D., Dr. P. H.
Dr. Charles H. Halliday, assistant director.
Bacteriology, Bureau of:
C. A. Perry, Sc. D., chief.
Chemistry, Bureau of:
W. F. Reindollar, Sc. D., chief.
Child Hygiene, Bureau of:
J. H. M. Knox, Jr., M. D., chief.
Communicable Diseases and Services for Crippled Children, Bureau of:
Charles H. Halliday, M. D., chief and epidemiologist.
Food and Drugs, Bureau of:
A. L. Sullivan, B. S., commissioner.
Legal Administration, Division of:
J. Davis Donovan, LL. B., chief.
Oral Hygiene, Division of:
R. C. Leonard, D. D. S., chief.
Personnel and Accounts, Division of:
W. N. Kirkman, chief.
Public Health Education, Division of:
Gertrude B. Knipp, A. B., chief.
Public Health Nursing, Division of:
Catherine Corley, R. N., nurse-instructor.
Sanitary Engineering, Bureau of:
G. L. Hall, chief.
Vital Statistics, Bureau of:
A. W. Hedrich, Sc. D., chief.
Publications:
Weekly Press Bulletin
Monthly Bulletin.
Annual Report.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

Boston

State Commissioner:
Paul J. Jakmauh, M. D.
Deputy Commissioner:
Alton S. Pope, M. D.
Administration, Division of:
Paul J. Jakmauh, M. D., director.
*Edward G. Huber, M. D., assistant director.
Adult Hygiene, Division of:
Herbert L. Lombard, M. D., director
Biologic Laboratories, Division of:
Elliott S. Robinson, M. D., director
Child Hygiene, Division of:
M. Louise Diez, M. D., director.
Communicable Diseases, Division of:
Roy F. Feemster, M. D., director.
Food and Drugs, Division of:
Hermann C. Lythgoe, B. S., director.
Genitoinfectious Diseases, Division of:
Ernest B. Howard, M. D., director.
Sanitary Engineering, Division of:
Arthur D. Weston, director.
Tuberculosis, Division of:
Alton S. Pope, M. D., director.
Publications:
Cancer Bulletin—monthly.
Bulletin of Genitoinfectious Diseases—monthly.
News Letter to Board of Health—bimonthly.
Contact—quarterly.
The Commonhealth—semiannually
Annual Report.

MICHIGAN DEPARTMENT OF HEALTH

Lansing

Commissioner:
H. Allen Moyer, M. D.
E. V. Thiehoff, M. D., M. P. H., acting deputy commissioner.
Business Administration, Bureau of:
W. G. Stevenson, director.
Education, Bureau of:
Marjorie Delavan, A. B., director.
Engineering, Bureau of:
John M. Hepler, C. E., director.
Epidemiology, Bureau of:
Wallace M. Chapman, M. D., M. P. H., director
Industrial Hygiene, Bureau of:
K. E. Markuson, M. D., M. P. H., director.
Laboratories, Bureau of:
C. C. Young, D. P. H., director.
Local Health Services, Bureau of:
E. V. Thiehoff, M. D., M. P. H., director.
Maternal and Child Health, Bureau of.
Lillian R. Smith, M. D., director.
Public Health Dentistry, Bureau of:
William R. Davis, D. D. S., director.
Public Health Nursing, Bureau of:
Helene B. Buker, R. N., M. A., director.
Records and Statistics, Bureau of:
Gertrude Pienta, acting director.
Tuberculosis Control, Bureau of:
George A. Sherman, M. D., director.
Publications:
Statistical Report of Communicable Diseases—weekly.
Michigan Public Health—monthly.
Interdepartmental Circular—bi-monthly.
Statistical Report, Bureau of Records and Statistics—yearly.
Annual Report.

MINNESOTA DEPARTMENT OF HEALTH

St. Paul

Secretary and Executive Officer:
A. J. Chesley, M. D.
Administration, Division of:
O. C. Pierson, director.
Birth and Death Records and Vital Statistics, Division of:
Gerda C. Pierson, director.
Child hygiene, Division of:
Viktor O. Wilson, M. D., M. P. H., director.
Dental Health Education:
Vern D. Irwin, D. D. S., P. H., dentist in charge.
Hotel Inspection, Division of:
Theo. T. Wold, director.
Industrial Health, Division of:
Leslie W. Foker, M. D., M. P. H., director.
Influenza Research Laboratory:
Carl M. Eklund, M. D., senior epidemiologist in charge.
Local Health Services, Division of:
R. N. Barr, M. D., M. P. H., director.
Preventable Diseases, Division of:
O. McDaniel, M. D., director.
Public Health Education:
Donald A. Dukelow, M. D., M. P. H., physician in charge.
Public Health Nursing, Division of:
Olivia T. Peterson, R. N., director.
Sanitation, Division of:
H. A. Whittaker, B. A., director.
Venereal Disease Control:
Ralph R. Sullivan, M. D., assistant director in charge, Preventable Disease Division.

MISSISSIPPI STATE BOARD OF HEALTH

Jackson

Administration:
Felix J. Underwood, M. D., F. A. C. P., secretary and executive officer.
*R. N. Whitfield, M. D., assistant secretary.
County Health Work:
J. A. Milne, M. D., M. P. H., director.
Field Unit:
H. B. Cottrell, M. D., C. P. H., supervisor.
Health Education:
Eleanor Hassell, B. A., M. P. H., supervisor.
Industrial Hygiene and Factory Inspection:
J. W. Dugger, M. D., director.
Laboratories:
H. C. Ricks, M. D., M. P. H., director.
Library:
Louise Williams, librarian.
Malaria Control:
Geo. E. Riley, M. D., C. P. H., supervisor.
Maternal and Child Health:
Maude M. Gerdes, M. D., director.
Mental Hygiene:
Estelle A. Magiera, M. D., supervisor.
Milk Sanitation:
N. M. Parker, D. V. M., supervisor.
Mouth Health:
Gladys Eyrich, B. L., supervisor.
Nutrition:
Mary Stansel, B. A., supervisor.
Preventable Disease Control:
A. L. Gray, M. D., M. P. H., director.
Public Health Engineering:
H. A. Kroeze, C. E., director.
Public Health Nursing:
Mary D. Osborne, R. N., supervisor.
Tuberculosis State Sanatorium:
Henry Boswell, M. D., F. A. C. P., superintendent.
Tuberculosis Control Field Unit:
Wm. D. Hickerson, M. D., supervisor.
Venereal Disease Control:
D. V. Galloway, M. D., M. P. H., supervisor.
Vital Statistics:
R. N. Whitfield, M. D., director.
Publication:
Biennial Report.

MISSOURI STATE BOARD OF HEALTH

Jefferson City

State Health Commissioner:
James Stewart, M. D.
Business Administration Division:
A. Louis Landwehr, director.
Child Hygiene Division:
M. L. Gentry, M. D., director.
Cosmetology and Hairdressing Division:
Mrs. Ramona Grimsley, director
Food and Drug Division:
Wm. C. Cruce, director.
Laboratories Division:
C. F. Adams, M. D., director.
Local Health Division:
John W. Williams, M. D., M. P. H., director.
Pneumonia Control and Epidemiology:
W. H. Aufranc, M. D., director.
Public Health Dentistry:
Allen Gruebbel, D. D. S., M. P. H., director.
Public Health Education:
Fred Rector, director.
Public Health Engineering:
W. Scott Johnson, B. S., M. S., chief.
Public Health Nursing:
Ella Mae Hott, R. N., director.
Venereal Disease Control:
Edgar B. Johnwick, M. D., acting director.
Vital Statistics Division:
James Carroll Pinkley, director.
Publications:
Morbidity Report—weekly.
Monthly Report.
Annual Report.

MONTANA STATE BOARD OF HEALTH

Helena

Administration:
W. F. Cogswell, M. D., C. M., secretary and executive officer.
Communicable Disease, Division of:
B. K. Kilbourne, M. D., epidemiologist.
Food and Drugs, Division of:
Donald E. Warner, B. S., director.
Hygienic Laboratory:
Edith Kuhns, B. S., director.
Industrial Hygiene, Division of:
L. M. Farner, M. D., A. B., C. P. H., director.
Maternal and Child Health, Division of:
Edythe P. Hershey, M. D., B. S., director.
Rural Health Work:
B. K. Kilbourne, M. D., director.
Vital Statistics, Division of:
L. L. Benepe, B. S., deputy State registrar.
Water and Sewage, Division of:
H. B. Foote, B. A., A. M., C. E., director.
Publications:
Report of Communicable Diseases—weekly.
Biennial Report of State Board of Health.
Public Health Nursing Notes—monthly.
Health-in-Education Leaflets—quarterly.

NEBRASKA STATE DEPARTMENT OF HEALTH

Lincoln

Director of Health:
A. L. Miller, M. D., F. A. C. S.
Community Sanitation:
Harry F. Glynn, assistant director.
Dental Hygiene, Division of:
J. R. Thompson, D. D. S., M. P. H., director.
Laboratory, Division of:
L. O. Vose, M. S., P. H. E., director.
Maternal and Child Health, Division of:
R. H. Loder, M. D., director.
Public Health Engineer:
T. A. Filipi, M. S.
Public Health Nursing Consultant:
Eleanor Palmquist, R. N.
Tuberculosis, Survey of Human:
E. A. Rogers, M. D., director.
Venereal Disease, Division of:
R. A. Frary, M. D., assistant epidemiologist.
Vital Statistics, Division of:
Grace Freidell.

NEVADA STATE DEPARTMENT OF HEALTH

Carson City

State Health Officer:
Edward E. Hamer, M. D.
Community Sanitation Program:
Webster B. Hunter, B. S., district supervisor.
Dental Hygiene, Division of:
O. M. Siefert, D. D. S., director.
Laboratories, Division of:
Vera E. Young, M. A. in P. H., director.
Local Health Administration and Epidemiology, Division of:
Gerald J. Sylvain, M. D., M. P. H., director and State epidemiologist.
Maternal and Child Health and Crippled Children's Services, Division of:
Wm. Morse Little, M. D., director.
Public Health Engineering, Division of:
W. W. White, E. M., C. P. H., director.
Tuberculosis Control Program:
Edward E. Hamer, M. D., director.
Venereal Disease Control, Division of:
*Byron H. Caples, M. D., director.
Vital Statistics, Division of:
John J. Sullivan, Jr., M. P. H., director
Publications:
State Department of Health Biennial Report.

NEW HAMPSHIRE STATE BOARD OF HEALTH

Concord

Secretary and Executive Officer:
Travis P. Burroughs, M. D., A. B., M. P. H.
Chemistry and Sanitation, Division of:
Charles D. Howard, S. B., director.
Crippled Children's Services, Division of:
Mary M. Atchison, M. D., A. B., director.
Epidemiology and Local Health Work, Division of:
Mary M. Atchison, M. D., A. B., acting director.
Laboratory of Hygiene:
Travis P. Burroughs, M. D., A. B., M. P. H., director.
Maternal and Child Health, Division of:
Mary M. Atchison, M. D., A. B., director.
Public Health Nursing, Division of:
Mary D. Davis, R. N., director.
Venereal Disease Control, Division of:
Alfred L. Frechette, M. D., director.
Vital Statistics, Department of:
Travis P. Burroughs, M. D., A. B., M. P. H., registrar.
Publications:
New Hampshire Health News—monthly.
Registration Report—biennially.
Report of the State Board of Health—biennially.

NEW JERSEY STATE DEPARTMENT OF HEALTH

Trenton

Director:
J. Lynn Mahaffey, M. D.
Administration, Bureau of:
E. R. Outcalt, chief.
Bacteriology, Bureau of:
John Mulcahy, chief.
Chemistry, Bureau of:
John E. Bacon, C. H. E., chief.
Dental Health Program:
J. M. Wisan, D. D. S., consultant.
Engineering, Bureau of:
Harry P. Croft, C. E., chief.
Food and Drugs, Bureau of:
Walter W. Scofield, B. A., B. S., chief.
Local Health Administration, Bureau of:
William H. MacDonald, B. L., M. S., chief.
Maternal and Child Health, Bureau of:
*Julius Levy, M. D., consultant.
Milk Sanitation:
I. H. Shaw, D. V. M., veterinarian.
Negro Health Program:
J. Earl Stuart, M. D., consultant.
Public Health Nursing, Advisory Service:
Elizabeth Curtis, R. N., consultant.
Shellfish Sanitation:
Edwin G. Applegate, B. S., senior chemist.
Venereal Disease Control, Division of:
Daniel Bergsma, M. D., P. H., chief.
Vital Statistics, Bureau of:
Walter R. Scott, chief.
Publications:
Public Health News—bimonthly.
Annual Report of the Department of Health of the State of New Jersey.

NEW MEXICO DEPARTMENT OF PUBLIC HEALTH

Santa Fe

Administration, Division of:
James R. Scott, M. D., Ph. D., director.
County Health Administration, Division of:
C. H. Douthirt, M. D., director.
Engineering Division:
Paul S. Fox, B. S., M. S., C. E., public health engineer.
Public Health Laboratory, State:
Myrtle Greenfield, M. A., director.
Public Health Nursing, Division of:
Fannie T. Warncke, director.
Venereal Disease Control, Division of:
E. F. McIntyre, M. D., C. P. H., director.
Vital Statistics, Division of:
Billy Tober, State registrar.
Publications:
Morbidity Statistics Bulletin—weekly
Vital Statistics Bulletin—monthly.
The New Mexico Health Officer—quarterly.

NEW YORK STATE DEPARTMENT OF HEALTH

Albany

Commissioner:
Edward S. Godfrey, Jr., M. D.
Paul B. Brooks, M. D., deputy commissioner.
Accounts, Division of:
Clifford C. Shoro, director.
Administrative Officer:
Edmund Schreiner, LL. B.
Cancer Control, Division of:
Louis C. Kress, M. D., director.
Communicable Diseases, Division of:
James E. Perkins, M. D., director.
Embalming and Undertaking, Bureau of.
Grace Haswell, principal clerk.
Laboratories and Research, Division of:
Augustus B. Wadsworth, M. D., director.
Local Health Administration:
V. A. Van Volkenburgh, M. D., assistant commissioner.
Malignant Diseases, State Institute for Study of:
Burton T. Simpson, M. D., director.
Maternity, Infancy and Child Hygiene, Division of:
Elizabeth M. Gardiner, M. D., director.
Medical Administration:
Edward S. Rogers, M. D., acting assistant commissioner.
Narcotic Control, Bureau of:
Ralph M. Weisman, Ph. G., acting supervisor.
Orthopedics, Division of:
Walter J. Craig, M. D., director.
Public Health Education, Division of:
Burt R. Rickards, S. B., director.
Public Health Nursing, Division of:
Marian W. Sheahan, R. N., director.
Sanitation, Division of:
Charles A. Holmquist, S. B., director.
Syphilis Control, Division of:
William A. Brumfield, M. D., director.
Tuberculosis, Division of:
William Siegal, M. D., director.
Tuberculosis Hospitals:
Robert E. Plunkett, M. D., general superintendent.
Vital Statistics, Division of:
J. V. DePorte, Ph. D., director.
Publications:
Health News—weekly.
Vital Statistics Review—monthly.
Annual Report.

NORTH CAROLINA STATE BOARD OF HEALTH

Raleigh

Secretary and State Health Officer:
  Carl V. Reynolds, M. D.
  G. M. Cooper, M. D., assistant State health officer.
County Health Work, Division of:
  R. E. Fox, M. D., director.
Epidemiology and Venereal Disease Control, Division of:
  J. C. Knox, M. D., director.
Health Education, Crippled Children's Work, Maternal and Child Health Service, Division of:
  G. M. Cooper, M. D., director.
Industrial Hygiene, Division of:
  T. F. Vestal, M. D., director.
Laboratories, Division of:
  John H. Hamilton, M. D., director.
Oral Hygiene, Division of:
  Ernest A. Branch, D. D. S., director.
Sanitary Engineering and Malaria Control, Division of:
  Warren H. Booker, C. E., director.
School Health Coordinating Service, Division of.
  Walter Wilkins, M. D., coordinator.
Vital Statistics, Division of:
  R. T. Stimpson, M. D., director.
Publications:
  The Health Bulletin—monthly.

NORTH DAKOTA STATE DEPARTMENT OF HEALTH

Bismarck

Administration, Division of:
  Maysil M. Williams, M. D., M. P. H., State health officer.
Child Hygiene, Division of:
  Viola Russell, M. D., director.
Laboratories, Division of:
  Melvin E. Koons, M. S., C. P. H., director.
Preventable Diseases, Division of:
  Frank J. Hill, M. D., director.
Sanitary Engineering, Division of:
  Harry Hanson, B. S., M. S., acting director.
Vital Statistics, Division of:
  Margaret D. Lang, B. S., director.
Publications:
  North Dakota's Health—weekly.
  Biennial Report.

OHIO DEPARTMENT OF HEALTH

Columbus

State Director of Health:
  R. H. Markwith, M. D.
  James E. Bauman, assistant.
Adult Hygiene Division:
  John B. Kistler, M. D., M. P. H., chief.
Audits and Reports Division:
  Harry C. Eader, chief.
Child Hygiene Division:
  Susan P. Souther, A. B., M. D., M. P. H., chief.
Dental Division:
  H. B. Millhoff, D. D. S., chief.
Engineering Division:
  F. H. Waring, B. S., San. E., B. S., C. E., chief.
Environmental Sanitation Division:
  Paul M. Holmes, B. C. E., chief.
Laboratory Division:
  Leo F. Ey, chief.
Legal Division:
  James E. Bauman, chief.
Nursing Division:
  S. Gertrude Bush, R. N., chief.
Vital Statistics Division:
  William Veigel, chief.

OKLAHOMA STATE DEPARTMENT OF PUBLIC HEALTH

Oklahoma City

Commissioner:
Grady F. Mathews, M. D.
J. P. Folan, assistant commissioner.
J. A. Morrow, M. D., deputy commissioner.
Accounting:
Floyd Harrington, B. S., auditor.
Epidemiology:
J. Y. Battenfield, M. D., director.
Food and Drug Division:
J. P. Folan, director.
Health Education:
Hugh Payne, director.
Industrial Hygiene:
E. C. Warkentin, B. S., M. S. P. H. E., engineer.
Laboratories:
F. R. Hassler, M. D., M. P. H., director.
Local Health Service, Bureau of:
J. W. Shackelford, M. D., M. P. H., director.
Malaria Control:
Milo Simmonds, B. S., engineer.
Maternal and Child Health:
J. T. Bell, M. D., director.
Milk Control:
Wm. J. Wyatt, B. S., M. P. H., specialist.
Nutritionist:
Maxine Turner, B. S.
Preventive Dentistry:
F. P. Bertram, D. D. S., M. P. H., director.
Public Health Engineering, Bureau of:
H. J. Darcey, B. S., director.
Public Health Nursing:
Josephine L. Daniel, R. N., B. S., director.
Technical Field Unit:
John F. Hackler, M. D., M. P. H., director.
Tuberculosis Control:
R. H. Gingles, M. D., director.
Venereal Disease Control:
Eugene A. Gillis, M. D., M. P. H., director.
Vital Statistics:
Clyde F. Ross, LL. B., director.
Publications:
The Sooner Sanitarian—monthly.
Annual Report.

OREGON STATE BOARD OF HEALTH

Portland

State Health Officer:
Frederick D. Stricker, M. D.
Bedding and Upholstery Inspector:
Allen French.
Cancer Control, Division of:
*Raymond Watson, M. D., director.
Dental and Oral Hygiene, Division of:
Floyd H. DeCamp, D. D. S., consultant.
Hygienic Laboratory:
Wm. Levin, Dr. P. H., director.
Maternal and Child Hygiene, Division of:
Harold M. Erickson, M. P. H., director.
Plumbing Inspector:
Arthur J. Farrell.
Public Health Education, Division of:
Ethel Mealy, M. A., consultant.
Public Health Nursing, Division of:
Lucile Perozzi, M. A., director.
Sanitary Engineering, Division of:
Curtiss M. Everts, Jr., director.
Tourist Campground Inspector:
A. R. Ashton.
Venereal Disease Control, Division of:
Sam D. Allison, M. D., director.
Vital Statistics, Division of:
Deward Waggoner, M. S. P. H., assistant registrar.
Publications:
Weekly Bulletin.

PENNSYLVANIA DEPARTMENT OF HEALTH

Harrisburg

Secretary:
A. H. Steward, M. D., deputy secretary, acting secretary of health.
Accounts, Division of:
E. J. MacNamara, chief.
Cancer Control, Division of:
Stanley P. Reimann, M. D., chief.
Comptroller:
Clinton T. Williams.
Dental Division:
Linwood G. Grace, D. D. S., chief.
Health Conservation, Bureau of:
J. Moore Campbell. M. D., director.
Industrial Hygiene, Bureau of:
William B. Fulton, M. D., director.
Laboratories, Division of:
Verner Nisbet, M. D., director.
Maternal and Child Health, Bureau of:
Paul Dodds, M. D., director.
Milk Sanitation, Bureau of:
Ralph E. Irvin, director
Narcotic Drug Control, Division of:
Frank D. Armstrong, chief.
Pneumonia Control, Division of:
Dale C. Stahle, M. D., chief.
Public Health Nursing, Bureau of:
Alice M. O'Halloran, R. N., director.
Sanitary Engineering, Bureau of:
Howard E. Moses, C. E., director.
School Medical Inspection, Division of:
John W. German, Jr., chief.
Supplies and Biologicals, Division of:
Walter F. Heintzelman, chief.
Tuberculosis Control, Bureau of:
Charles R. Reynolds, M. D., director.
Venereal Diseases, Division of:
Edgar S. Everhart, M. D., chief.
Vital Statistics, Bureau of:
Tom E. Williams, director.
Publications:
Pennsylvania's Health—monthly.

PHILIPPINE ISLANDS BUREAU OF HEALTH[1]

Manila

Director:
Eusebio D. Aguilar, M. D.
Administration, Division of:
Felipe Arenas, M. D., C. P. H., chief.
Epidemiology, Division of:
Jose Guidote, M. D., C. P. H., chief.
Hospitals, Division of:
Sulpico Chiyuto, M. D., chief.
Maternal and Child Hygiene, Division of:
Enrique F. Ochoa, M. D., C. P. H., chief.
National Charity Clinics:
Vicente Kierulf, M. D., medical supervisor.
Sanitation, Division of:
Gabriel Intengan.
Publications:
Annual Report of the Office of the Commissioner of Health and Welfare.
Annual Report of the Bureau of Health.
Monthly Bulletin of the Bureau of Health.
The "Health Messenger" of the Bureau of Health—monthly.

[1] No information was obtained from the Philippine Islands covering personnel employed as of September 1, 1941. The information listed represents that which was published in 1940.

PUERTO RICO DEPARTMENT OF HEALTH

San Juan

Commissioner of Health:
E. Garrido Morales, M. D., Dr. P. H.
R. Berríos Berdecía, M. D., assistant commissioner, section of public health.
Pedro S. Malaret, M. D., assistant commissioner, section of public welfare.
Biological Laboratory:
Ó. Costa Mandry, M. D., C. T. M., director.
Chemical Laboratory:
Rafael del Valle Sárraga, A. B., B. S., Ph. C., M. T., director.
Epidemiology and Vital Statistics, Bureau of:
Abel de Juan, M. D., M. P. H., chief.
General Inspection of Construction and Plumbing, Bureau of:
José Cantellops, S. E., chief.
General Sanitary Inspection, Bureau of:
W. F. Lippitt, M. D., chief.
Health Education Office:
Thomás Blanco, M. D., director.
Malaria, Bureau of:
Antonio Arbona, M. D., chief.
Maternal and Infant Hygiene, Bureau of:
Marta Robert, M. D., chief.
Property and Accounts, Division of:
Rafael M. Méndez, Ph. G., chief.
Public Health Units, Bureau of:
José Chaves, M. D., chief.
Rural Medical Centers, Division of:
José Alum Pérez, M. D., chief
Sanitary Engineering, Bureau of:
Juan G. Figueroa, C. E., chief
Social Welfare, Bureau of:
Beatriz Lassalle, chief.
Tuberculosis, Bureau of:
J. Rodríguez Pastor, M. D., chief
Venereal Diseases, Division of:
Ernesto Quintero, M. D., chief.
Publications:
Puerto Rico Health Bulletin—monthly.

RHODE ISLAND DEPARTMENT OF HEALTH

Providence

Director:
Edward A. McLaughlin, M. D., State registrar.
Administration, Division of:
Edward P. Conaty, Ph. B., business manager.
Crippled Children, Division of:
*William A. Horan, M. D., chief.
Examiners, Division of:
Thomas B. Casey, Ph. B., chief.
Laboratories, Division of:
Edgar J. Staff, A. M., M. Sc., chief.
Maternal and Child Health, Division of:
Francis V. Corrigan, M. D., chief.
Narcotic Drugs and Pharmacies, Division of:
Joseph J. Cahill, drugs control administrator.
Preventable Diseases, Division of:
William P. Shields, M. D., epidemiologist.
Sanitary Engineering, Division of:
Charles L. Pool, M. Sc., chief.
State Sanatorium, Division of:
Ubaldo E. Zambarano, M. D., superintendent.
Vital Statistics, Division of:
Genevieve E. Dolan, assistant State registrar.
Publications:
Annual Report.
Registration Report—yearly.

SOUTH CAROLINA STATE BOARD OF HEALTH

Columbia

State Health Officer:
James A. Hayne, M. D.
Administration, Division of:
James A. Hayne, M. D.
Cancer Control, Division of:
C. L. Guyton, M. D., director.
Communicable Diseases, Division of:
G. E. McDaniel, M. D., director.
Crippled Children, Division of:
H. G. Callison, M. D., director.
Dental Division:
G. A. Bunch, D. D. S., director.
Hygienic Laboratory:
H. M. Smith, M. D., director.
Industrial Hygiene, Division of:
Harry F. Wilson, M. D., director.
Maternal and Child Health, Division of:
R. W. Ball, M. D., director.
Rural Sanitation and County Health Work:
Ben F. Wyman, M. D., director.
Tuberculosis Sanatorium:
Col. Wm. F. Moncrief, M. D., superintendent.
Venereal Disease Control:
Sedgwick Simons, M. D., director.
Vital Statistics Department:
M. B. Woodward, M. D., assistant State registrar.
Publications
Annual Report.

SOUTH DAKOTA STATE BOARD OF HEALTH

Pierre

State Health Officer:
J. F. D. Cook, M. D., F. A. C. S.
G. J. VanHeuvelen, M. D., M. P. H., assistant.
Administration, Division of:
J. F. D. Cook, M. D., F. A. C. S., superintendent.
Epidemiology and Venereal Diseases, Division of:
G. J. VanHeuvelen, M. D., M. P. H., director.
Laboratories, Division of:
*J. C. Ohlmacher, M. D., director.
Maternal and Child Health, and Crippled Children, Division of:
A. Triolo, M. D., M. P. H., director.
Medical Licensure, Division of:
J. F. D. Cook, M. D., F. A. C. S., superintendent.
Public Health Nursing, Division of:
Alice Olson, R. N., director.
Records and Accounts, Division of:
Esther Kempter, auditor and chief clerk.
Sanitary Engineering, Division of:
W. W. Towne, C. E., M. S., director
Vital Statistics, Division of
J. F. D. Cook, M. D., F. A. C. S., special agent.
Publications.
Epidemiology Report—weekly.
The Clarifier—monthly.
Vital Statistics Report—monthly.
Annual Report (Vital Statistics).
Biennial Report (All Divisions).

TENNESSEE DEPARTMENT OF PUBLIC HEALTH

Nashville

Commissioner:
W. C. Williams, M. D., C. P. H.
Laboratories, Division of:
Cooper Brougher, B. S., acting director.
Local Health Service:
Monroe F. Brown, M. D., C. P. H., acting director.
Preventable Diseases, Division of:
C. B. Tucker, M. D., C. P. H., director.
Sanitary Engineering, Division of:
Howard D. Schmidt, B. E., director.
Tuberculosis Control, Division of:
R. S. Gass, M. D., C. M., director.
Vital Statistics, Division of:
Ruth R. Puffer, A. B.
Publications:
Health Briefs—monthly.
Monthly News Letter.
Morbidity Statistics—monthly.
Annual Report of the Department of Public Health.
Vital Statistics Bulletin—yearly.
Morbidity Bulletin—yearly.
Annual Health Works' Conference Proceedings.
Biennial Report of the Department of Public Health.

TEXAS STATE DEPARTMENT OF HEALTH

State Health Officer:
Geo. W. Cox, M. D.
Dental Health:
Edward Taylor, D. D. S., director.
Engineering, Bureau of:
V. M. Ehlers, C. E., consultant.
Food and Drugs, Bureau of:
F. D. Brock, Ph.G., director.
Industrial Hygiene Division:
C. A. Nau, M. A., M. D., director.
Laboratories, Bureau of:
S. W. Bohls, M. D., director.
Local Health Services:
G. W. Luckey, M. D., director.
Maternal and Child Health:
J. M. Coleman, M. D., M. P. H., F. A. A. P., director.
Public Health Education:
L. E. Bracy, B. A., director.
Tuberculosis Division:
H. E. Smith, M. D., F. A. C. P., director
Venereal Disease Division:
A. M. Clarkson, M. D., M. P. H., director.
Vital Statistics, Bureau of:
W. A. Davis, M. D., director.
Publications:
Morbidity Statistics Bulletin—weekly.
The Bulletin—monthly.
Good Morning Judge—monthly.
Biennial Reports.
Information Service—no dates established.

UTAH STATE BOARD OF HEALTH

Salt Lake City

State Health Commissioner:
Wm. M. McKay, M. D., M. P. H.
Comptroller and Personnel Director:
T. K. Callister, M. B. A.
Crippled Children's Service, Division of:
A. C. Thurman, M. D., C. P. H., director.
Dental Health, Division of:
R. C. Dalgleish, D. D. S., director.
Engineering and Sanitation, Division of:
Lynn M. Thatcher, B. S., director.
Epidemiology:
Wm. M. McKay, M. D., M. P. H., director.
Fiscal Officer:
Verna Durrant.
Industrial Hygiene, Division of:
J. L. Jones, M. D., Dr. P. H., director.
Laboratories, Division of:
E. H. Bramhall, B. S., director.
Local Health Administration, Division of:
D. D. Carr, M. D., C. P. H., director.
Maternal and Child Health, Division of:
Lela J. Beebe, M. D., director.
Public Health Nursing, Division of:
Vera Klingman, P. H. N., B. S., director
Venereal Disease Control, Bureau of:
W. W. Bigelow, M. D., C. P. H., director.
Vital Statistics, Division of:
Eva W. Ramsey, director and deputy State registrar
Publications:
Communicable Disease Report—weekly.
"MCH News Letter"—monthly.
Utah Health Bulletin—quarterly.

VERMONT DEPARTMENT OF PUBLIC HEALTH

Burlington

Secretary and Executive Officer:
C. F. Dalton, M. D.
Communicable Diseases and Venereal Disease Control Division:
F. S. Kent, M. D., director.
Crippled Children's Division:
Lillian E. Kron, R. N., director.
Laboratory of Hygiene:
C. F. Whitney, M. D., director.
Maternal and Child Health Division:
Paul D. Clark, M. D., director.
Public Health Nursing:
Nellie M. Jones, R. N., director.
Sanitary Engineering:
E. L. Tracy, C. E., director.
Tuberculosis and Industrial Hygiene Division:
H. W. Slocum, A. B., director.
Publications:
Modern Health Crusader—five times a year.
Biennial Report.

VIRGINIA STATE DEPARTMENT OF HEALTH

Richmond

Administration:
I. C. Riggin, M. D., State health commissioner.
Communicable Diseases, Bureau of:
William Grossmann, M. D., director.
Crippled Children's Bureau:
E. C. Harper, M. D., director.
Health Education, Bureau of:
J. C. Funk, Sc. D., director.
Industrial Hygiene, Bureau of:
J. B. Porterfield, M. D., director.
Laboratories, Bureau of:
Adah Corpening, director.
Maternal and Child Health, Bureau of:
A. L. Carson, M. D., director.
Mouth Hygiene, Division of:
N. T. Ballou, D. D. S., director.
Public Health Nursing, Bureau of:
Mary I. Mastin, R. N., director.
Rural Health, Bureau of:
L. J. Roper, M. D., director.
Sanitary Engineering, Bureau of:
Richard Messer, C. E., director.
Tuberculosis Out-Patient Service:
E. C. Harper, M. D., director.
Venereal Disease Control, Division of:
E. M. Holmes, Jr., M. D., director.
Vital Statistics, Bureau of:
W. A. Plecker, M. D., registrar.
Publications:
Health Bulletin—monthly.

VIRGIN ISLANDS DEPARTMENT OF HEALTH

Charlotte Amalie

Commissioner of Health, Chief Municipal Physician and Registrar, St. Thomas:
Knud Knud-Hansen, M. D., F. A. C. S.
Assistant Commissioner of Health, Chief Municipal Physician, and Registrar, St. Croix:
Meredith Hoskins, M. D.
Sanitation Service, St. Thomas:
Cyril Creque, chief clerk.
Publications:
Report of Notifiable Diseases—monthly.

WASHINGTON STATE DEPARTMENT OF HEALTH

Seattle

Director:
Donald G. Evans, M. D., B. S., M. P. H., Dr. P. H.
Crippled Children, Division of:
James W. Havlland, M. D., A. B., chief.
Epidemiology and Venereal Disease Control, Division of:
L. A. Dewey, M. D., B. Sc., Dr. P. H., chief.
Laboratory, Division of:
A. U. Simpson, M. D., B. S., chief.
Maternal and Child Hygiene, Division of:
Percy F. Guy, M. D., M. P. H., chief.
Public Health Engineering, Division of:
M. S. Campbell, B. S., M. S., chief.
Public Health Nursing, Division of:
Anna R. Moore, R. N., B. S., C. P. H. N., chief.
Tuberculosis Control, Division of:
K. M. Soderstrom, M. D., B. S., M. P. H., chief.
Vital Statistics, Division of:
Francis D. Rhoads, A. B., M. A., C. P. H., chief and State registrar.
Publications:
Weekly Communicable Disease Report.
Water Supply and Sewage News—bimonthly.
Statistical Bulletin—at irregular intervals.
Annual Report.

WEST VIRGINIA STATE HEALTH DEPARTMENT

Charleston

Commissioner:
C. F. McClintic, M. D., B. S.
Barbers and Beauticians, Bureau of:
E. L. Peters, director.
Communicable Diseases, Division of:
Albert M. Price, M. D., C. P. H., director.
Dental Hygiene, Bureau of:
Russell K. Smith, M. S., D. D. S., director.
Industrial Hygiene, Bureau of:
J. William Crosson, B. A., M. D., director.
Public Health Education, Bureau of:
Dorothea Campbell, director.
Public Health Nursing, Bureau of:
Laurene C. Fisher, R. N., director.
Sanitary Engineering, Division of:
J. B. Harrington, B. E., director.
State Hygienic Laboratory:
Katherine E. Cox, B. A., director.
Tuberculosis, Bureau of:
W. E. McIlvain, M. S., B. S., director.
Vital Statistics, Division of:
Franklin H. Reeder, M. B., director.
Publications:
Community Sanitation News Letter—biweekly.
Monthly News Letter.
The Sanitarian—bimonthly.
Biennial Report.

WISCONSIN STATE BOARD OF HEALTH

Madison

State Health Officer:
C. A. Harper, B. S., M. D.
Carl N. Neupert, M. D., M. S. P. H., assistant.
Communicable Diseases, Bureau of:
Harry M. Guilford, B. S., M. D., chief.
Community Sanitation:
Roderick F. Bott, B. S., supervisor.
Dental Education:
F. A. Bull, D. D. S., M. P. H., supervisor.
Industrial Hygiene:
Paul A. Brehm, B. S., M. D., supervisor.
Local Health Services:
E. H. Jorris, B. A., M. D., M. S. P. H.
Maternal and Child Health:
Amy Louise Hunter, A. B., M. S., M. D., Dr. P. H., chief.
Nursing Education:
Leila I. Given, B. S., R. N., director.
Public Health Nursing, Division of:
Cornelia van Kooy, R. N., supervisor.
Sanitary Engineering and Stream Pollution:
L. F. Warrick, B. S., M. S., State sanitary engineer.
Venereal Disease Control Officer:
Milton Trautmann, B. S., M. D., M. P. H.
Vital Statistics:
Francis E. Koster, Ph. B., assistant registrar.
Publications:
Prevalence of Communicable Diseases—weekly.
Quarterly Bulletin.
Biennial Report.

WYOMING STATE DEPARTMENT OF HEALTH

Cheyenne

State Health Officer:
M. C. Keith, M. D.
Dental Health, Division of:
C. H. Carpenter, D. D. S., director.
Epidemiology, Division of:
N. H. Savage, M. D., C. P. H., director.
Maternal and Child Health, and Crippled Children, Division of:
Margaret H. Jones, M. D., M. A., C. P. H., director.
Public Health Laboratories, Division of:
Ralph B. Williams, B. S.
Sanitary Engineering, Division of:
L. O. Williams, Jr., B. S., C. P. H., director.
Vital Statistics, Division of:
Stanley G. Hanks, B. S., M. S., C. P. H., director.
Publications:
Communicable Disease Report—weekly.
Healthful Living Bulletin—monthly.
Public Health Nurses Bulletin—monthly.

DEATHS DURING WEEK ENDED OCTOBER 25, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Oct. 25, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,856	8,060
Average for 3 prior years	7,956	
Total deaths, first 43 weeks of year	358,385	359,788
Deaths per 1,000 population, first 43 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	577	452
Average for 3 prior years	481	
Deaths under 1 year of age, first 43 weeks of year	22,611	21,459
Data from industrial insurance companies:		
Policies in force	64,549,170	64,801,951
Number of death claims	11,681	10,615
Death claims per 1,000 policies in force, annual rate	9.4	8.6
Death claims per 1,000 policies, first 43 weeks of year, annual rate	9.5	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 1, 1941

Summary

Of the 9 communicable diseases reported weekly by the State health officers and included in the following table, only influenza and poliomyelitis were above the 5-year (1936–40) median expectancy.

A total of 285 cases of poliomyelitis was reported, as compared with 294 cases for the preceding week, 195 for the 5-year median, and 624 cases for the week ended August 30, the peak week for the current year. The slow decline is due to the persistence of the disease in the Middle Atlantic, East North Central, and East South Central States, which areas recorded increases during the current week. The following named 5 States reported 15 or more cases (last week's figures in parentheses): New York 67 (57); Tennessee 23 (22); Alabama 22 (12); New Jersey 20 (15); Illinois 20 (12).

The number of reported cases of influenza increased from 1,330 to 1,553, of which Texas reported 759 and South Carolina 293. From June 1 to November 1, of a total of 19,384 cases of influenza reported in the United States, 7,796 cases, or 40 percent, have been reported in Texas.

Of 633 cases of diphtheria reported for the current week, 267, or 42 percent, occurred in the South Atlantic States, and of 3,291 cases of whooping cough, 2,158, or 66 percent, were reported in the East North Central, Middle Atlantic, and South Atlantic areas.

Four of the 8 cases of smallpox reported for the week occurred in the West North Central States. Of 58 cases of endemic typhus fever, 17 occurred in Georgia, 10 in Louisiana, and 8 in Texas.

The death rate for the current week for 88 large cities is 11.2 per 1,000 population as compared with 11.0 for both the preceding week and the 3-year (1938–40) average. The accumulative rate to date is 11.7, the same as for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended November 1, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940	
NEW ENG.												
Maine	0	1	1	-------	1	-------	55	75	30	0	0	0
New Hampshire	1	0	0	-------	-------	-------	0	0	2	0	0	0
Vermont	1	0	0	-------	-------	-------	2	3	8	0	0	0
Massachusetts	2	4	3	-------	-------	-------	145	173	80	1	2	0
Rhode Island	1	0	1	-------	-------	-------	10	0	2	0	1	0
Connecticut	1	0	2	1	-------	1	43	3	7	1	0	0
MID. ATL.												
New York [1]	22	11	18	[2] 1	[2] 10	[2] 10	101	200	128	1	2	5
New Jersey	10	7	11	6	4	12	17	134	25	1	0	0
Pennsylvania	9	15	34	1	-------	-------	112	531	40	2	0	2
E. NO. CEN.												
Ohio	21	18	48	11	20	7	52	25	25	2	1	1
Indiana	22	7	31	16	5	16	3	9	9	3	1	2
Illinois	16	27	35	8	3	10	31	147	25	0	2	2
Michigan [3]	5	7	22	-------	2	2	35	127	59	1	3	1
Wisconsin	4	1	2	10	27	24	110	205	33	1	1	0
W. NO. CEN.												
Minnesota	0	2	4	-------	-------	-------	6	9	16	1	1	1
Iowa	8	9	5	1	2	1	21	51	19	0	1	0
Missouri	3	19	21	6	5	17	3	1	5	3	0	0
North Dakota	5	2	2	-------	-------	-------	15	4	1	0	1	1
South Dakota	3	1	1	-------	-------	-------	1	4	3	0	0	0
Nebraska	2	2	2	-------	-------	1	3	9	3	0	0	0
Kansas	2	5	8	6	1	2	29	5	5	0	1	1
SO. ATL.												
Delaware	4	0	0	-------	-------	-------	1	3	3	0	0	0
Maryland [3]	5	3	10	5	2	4	16	6	6	0	0	0
Dist. of Columbia	4	1	4	1	-------	-------	0	3	3	0	0	0
Virginia	37	22	63	70	67	57	36	20	20	1	1	1
West Virginia	10	4	21	2	6	10	61	4	8	0	1	1
North Carolina [1]	140	49	142	-------	4	4	84	6	101	2	0	2
South Carolina [4]	32	20	25	293	331	294	34	3	4	1	1	1
Georgia [4]	34	9	44	14	14	14	5	2	1	0	2	1
Florida [4]	1	7	15	22	1	2	3	1	14	0	0	0
E. SO. CEN.												
Kentucky	13	18	33	7	2	9	49	59	20	0	2	2
Tennessee [1 4]	27	9	32	14	6	27	10	5	5	2	0	0
Alabama [4]	23	12	39	28	14	46	51	5	5	1	5	2
Mississippi [3 4]	20	7	15	-------	-------	-------	-------	-------	-------	0	0	0
W. SO. CEN.												
Arkansas	29	10	19	41	23	48	17	2	2	0	0	0
Louisiana [4]	4	21	18	9	2	3	1	1	1	0	0	0
Oklahoma	11	19	22	50	31	33	5	0	1	0	0	0
Texas [1]	77	30	58	759	271	203	38	10	18	4	0	0
MOUNTAIN												
Montana	0	5	1	2	7	7	19	3	13	0	1	1
Idaho	0	1	1	-------	5	3	27	2	5	0	0	0
Wyoming [1]	3	0	0	4	1	-------	4	1	2	0	0	0
Colorado	4	2	6	14	7	3	33	24	21	0	0	0
New Mexico	1	0	4	1	-------	1	63	6	6	0	0	0
Arizona	0	7	3	85	68	36	75	22	3	0	0	0
Utah [3]	0	0	1	4	4	2	5	3	12	0	0	1
Nevada	0	0	-------	-------	-------	-------	0	0	-------	0	0	-------
PACIFIC												
Washington	1	6	2	-------	-------	-------	3	5	20	2	1	0
Oregon	0	3	2	13	17	17	19	6	9	0	0	0
California	15	11	24	48	13	22	225	25	39	0	2	2
Total	633	414	997	1,553	976	976	1,678	1,942	1,750	30	33	33
44 weeks	12,662	12,632	21,661	577,329	175,897	157,887	841,437	239,512	274,513	1,735	1,452	2,531

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 1, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940		Nov. 1, 1941	Nov. 2, 1940	
NEW ENG.												
Maine	0	0	0	12	4	6	0	0	0	1	1	1
New Hampshire	1	0	0	7	1	2	0	0	0	0	0	0
Vermont	1	0	0	3	6	4	0	0	0	0	2	0
Massachusetts	7	3	2	145	80	80	0	0	0	2	2	2
Rhode Island	0	0	0	4	4	6	0	0	0	0	0	0
Connecticut	0	0	0	17	21	30	0	0	0	1	3	2
MID. ATL.												
New York	67	9	9	178	150	178	0	0	0	9	8	15
New Jersey	20	1	1	73	73	60	0	0	0	4	3	3
Pennsylvania	14	8	8	111	161	230	0	0	0	11	7	15
E. NO. CEN.												
Ohio	9	23	10	116	178	227	0	0	0	5	21	15
Indiana	2	11	4	51	43	99	1	1	3	2	1	4
Illinois	20	31	18	148	266	243	0	4	2	2	3	14
Michigan [3]	11	49	13	131	95	187	1	3	1	5	3	4
Wisconsin	5	36	3	111	121	125	0	0	3	1	1	1
W. NO. CEN.												
Minnesota	5	18	10	45	57	72	0	0	3	1	0	0
Iowa	1	21	15	39	66	69	1	0	8	4	2	1
Missouri	2	1	1	52	30	77	1	0	1	3	9	9
North Dakota	1	0	0	12	4	21	1	6	6	1	1	1
South Dakota	0	4	1	6	19	19	0	1	2	0	0	0
Nebraska	0	8	4	8	17	17	0	0	0	4	1	0
Kansas	1	12	2	48	60	99	1	0	1	0	2	2
SO. ATL.												
Delaware	5	0	0	6	7	6	0	0	0	0	0	1
Maryland [3]	6	1	1	39	41	44	0	0	0	5	4	8
Dist. of Col.	2	0	0	12	8	10	0	0	0	0	1	1
Virginia	7	12	1	50	53	49	0	0	0	14	5	8
West Virginia	2	25	2	75	50	79	0	0	0	3	5	9
North Carolina [1]	4	3	1	102	78	83	0	0	0	4	3	7
South Carolina [4]	3	0	0	17	44	21	0	0	0	5	3	5
Georgia [4]	5	0	1	18	38	30	0	0	0	7	7	11
Florida [4]	7	1	1	6	4	11	0	0	0	1	2	1
E. SO. CEN.												
Kentucky	7	5	2	50	65	65	1	0	0	11	22	14
Tennessee [1] [4]	23	0	0	59	23	46	0	2	2	12	1	9
Alabama [4]	22	0	0	58	38	26	0	0	0	3	4	5
Mississippi [3] [4]	0	0	1	12	14	14	0	0	0	0	4	4
W. SO. CEN.												
Arkansas	5	1	1	6	20	20	0	1	1	9	11	9
Louisiana [4]	0	7	1	4	8	8	0	2	0	5	6	7
Oklahoma	1	3	3	21	21	23	0	2	2	1	7	9
Texas [4]	4	2	3	37	37	41	0	0	2	6	9	23
MOUNTAIN												
Montana	1	3	0	25	13	26	0	0	1	0	4	3
Idaho	0	1	0	14	13	13	0	0	0	0	3	2
Wyoming [1]	0	0	0	5	4	8	0	0	0	2	0	0
Colorado	1	2	1	18	9	31	1	1	1	1	3	3
New Mexico	1	0	2	3	4	11	0	0	0	6	1	5
Arizona	0	0	0	0	1	6	0	0	0	0	1	2
Utah [3]	4	3	1	5	4	19	0	0	0	1	0	0
Nevada	0	0	------	0	1	------	0	0	------	0	1	------
PACIFIC												
Washington	1	15	1	44	25	25	0	1	2	1	2	2
Oregon	2	2	2	12	10	21	0	0	1	3	1	3
California	5	9	9	89	62	147	0	1	1	3	2	7
Total	285	330	195	2,104	2,160	2,916	8	25	56	159	182	269
44 weeks	8,170	8,713	6,452	105,342	133,540	157,454	1,252	2,114	8,861	7,578	8,581	12,691

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 1, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended Nov. 1, 1941	Whooping cough, Week ended Nov. 2, 1940	Division and State	Whooping cough, Week ended Nov. 1, 1941	Whooping cough, Week ended Nov. 2, 1940
NEW ENG.			SO. ATL.—continued		
Maine	14	27	South Carolina [4]	77	37
New Hampshire	7	8	Georgia [4]	20	11
Vermont	19	3	Florida [4]	18	10
Massachusetts	168	172			
Rhode Island	28	16	E. SO. CEN.		
Connecticut	84	86			
			Kentucky	100	96
MID. ATL.			Tennessee [1, 4]	45	20
			Alabama [4]	5	19
New York [1]	426	431	Mississippi [3, 4]		
New Jersey	164	129			
Pennsylvania	199	754	W. SO. CEN.		
E. NO. CEN.			Arkansas	17	57
			Louisiana [4]	6	12
Ohio	196	343	Oklahoma	1	12
Indiana	19	10	Texas [4]	88	86
Illinois	161	173			
Michigan [3]	335	279	MOUNTAIN		
Wisconsin	308	174			
			Montana	39	0
W. NO. CEN.			Idaho	6	9
			Wyoming [1]	8	2
Minnesota	66	123	Colorado	38	31
Iowa	20	42	New Mexico	6	10
Missouri	11	23	Arizona	10	2
North Dakota	8	28	Utah [3]	20	21
South Dakota	8	6	Nevada	0	0
Nebraska	6	13			
Kansas	40	51	PACIFIC		
SO. ATL.			Washington	64	53
			Oregon	16	8
Delaware	3	32	California	185	300
Maryland [3]	31	87			
Dist. of Col.	24	11	Total	3,291	4,095
Virginia	61	87			
West Virginia	13	50	44 weeks	180,934	139,088
North Carolina [1]	103	141			

[1] Rocky Mountain spotted fever, 4 cases, as follows: New York, 1; North Carolina, 1; Tennessee, 1; Wyoming, 1 (delayed report).
[2] New York City only.
[3] Period ended earlier than Saturday.
[4] Typhus fever, 58 cases as follows: South Carolina, 6; Georgia, 17; Florida, 5; Tennessee, 2; Alabama, 7; Mississippi, 3; Louisiana, 10; Texas, 8.

WEEKLY REPORTS FROM CITIES

City reports for week ended Oct. 18, 1941

This table lists the reports from 131 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	0	3	0	0	0	3	19
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	6
Nashua	0	------	0	0	0	0	0	0	0	0	6
Vermont:											
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	0	------	1	4	3	20	0	6	0	31	203
Fall River	0	------	0	0	0	5	0	0	0	2	27
Springfield	0	------	0	16	0	12	0	0	0	8	29
Worcester	0	------	0	1	4	6	0	1	0	8	53
Rhode Island:											
Pawtucket	1	------	0	0	0	0	0	0	0	0	12
Providence	1	------	0	3	2	3	0	3	0	19	49
Connecticut:											
Bridgeport	0	------	0	1	1	0	0	0	0	0	25
Hartford	0	------	0	0	0	1	0	0	0	0	38
New Haven	1	------	0	9	0	2	0	0	0	3	40
New York:											
Buffalo	0	------	1	0	4	6	0	3	0	8	105
New York	11	4	0	15	37	35	0	72	7	168	1,276
Rochester	0	------	0	2	0	5	0	2	0	3	65
Syracuse	0	------	0	0	0	0	0	0	0	10	56
New Jersey:											
Camden	1	------	0	0	1	0	0	1	0	10	20
Newark	0	------	0	1	2	3	0	3	1	45	86
Trenton	1	------	0	0	3	0	0	2	0	0	44
Pennsylvania:											
Philadelphia	0	------	0	1	11	17	0	19	1	49	397
Pittsburgh	2	2	0	1	10	4	0	3	4	24	145
Reading	0	------	0	1	0	0	0	1	0	0	24
Scranton	0	------	------	1	------	1	0	------	0	0	------
Ohio:											
Cincinnati	0	------	0	0	1	12	0	5	0	16	109
Cleveland	2	2	0	1	8	23	0	8	2	26	187
Columbus	0	------	0	0	2	8	0	2	0	9	86
Toledo	0	------	0	0	3	5	0	5	0	15	57
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	1	10
Fort Wayne	0	------	0	0	1	1	0	2	0	0	25
Indianapolis	2	------	0	0	10	14	0	4	1	6	89
Muncie	0	------	0	1	2	2	0	0	0	1	16
South Bend	0	------	0	0	0	0	0	0	0	0	12
Terre Haute	0	------	0	0	2	0	0	0	0	0	32
Illinois:											
Chicago	9	------	2	11	16	36	0	28	1	97	634
Elgin	0	------	0	0	0	0	0	1	0	6	15
Moline	0	------	0	0	0	1	0	0	1	6	4
Springfield	0	------	0	1	1	1	0	0	0	0	22
Michigan:											
Detroit	2	------	0	10	3	28	0	17	0	59	222
Flint	0	------	0	0	4	0	0	0	0	2	30
Grand Rapids	0	------	0	1	0	0	0	0	0	7	27
Wisconsin:											
Kenosha	0	------	0	0	0	2	0	0	0	2	3
Madison	0	------	0	3	0	3	0	0	0	5	7
Milwaukee	0	------	0	4	2	15	0	0	1	80	105
Racine	0	------	0	2	0	3	0	0	0	12	11
Superior	0	------	0	0	0	0	0	0	0	4	9
Minnesota:											
Duluth	0	------	0	0	0	5	0	1	0	8	21
Minneapolis	2	------	0	0	0	4	0	2	1	23	104
St. Paul	0	------	0	0	4	11	0	0	0	12	48
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	0	------	0	1	0	2	0	0	0	0	22
Sioux City	0	------	------	0	------	0	0	------	0	0	------
Waterloo	2	------	------	0	------	2	0	------	2	0	------

City reports for week ended Oct. 18, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0	------	1	1	3	5	0	5	0	7	98
St. Joseph	0	------	0	0	2	2	0	0	0	0	18
St. Louis	0	------	0	1	5	13	0	2	1	8	168
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	1	8
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	1	0	0	0	0	0	0	5
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	9
Nebraska:											
Lincoln	0	------	------	0	------	0	0	------	0	0	------
Omaha	1	------	0	0	3	4	0	1	0	1	58
Kansas:											
Lawrence	0	1	1	1	0	0	0	0	0	0	1
Topeka	0	------	0	0	1	10	0	0	0	3	8
Wichita	0	1	1	0	0	2	0	0	1	0	25
Delaware:											
Wilmington	1	------	0	0	1	3	0	0	0	0	15
Maryland:											
Baltimore	2	1	0	9	9	9	0	7	1	21	202
Cumberland	0	------	0	0	0	0	0	0	0	0	13
Frederick	0	------	0	0	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	2	------	0	4	2	14	0	11	1	25	167
Virginia:											
Lynchburg	3	------	0	0	0	1	0	0	0	0	4
Norfolk	3	------	------	0	2	1	0	0	0	1	25
Richmond	1	------	1	1	0	1	0	1	0	0	52
Roanoke	0	------	0	0	0	1	0	0	0	0	8
West Virginia:											
Charleston	1	------	0	0	1	1	0	1	0	0	27
Huntington	1	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	2	2	1	0	1	0	1	22
North Carolina:											
Gastonia	1	------	------	0	------	0	0	------	0	0	------
Wilmington	1	------	0	1	1	2	0	0	0	10	11
Winston-Salem	3	------	0	5	1	1	0	1	0	0	13
South Carolina:											
Charleston	3	2	0	0	4	0	0	1	0	0	23
Florence	0	------	0	0	0	1	0	1	0	1	11
Greenville	3	------	0	0	0	1	0	0	0	0	23
Georgia:											
Atlanta	3	7	0	0	3	10	0	4	0	0	71
Brunswick	0	------	0	0	1	0	0	0	0	0	4
Savannah	0	------	0	2	0	0	0	0	0	0	29
Florida:											
Miami	1	------	0	0	3	1	0	3	0	5	35
St. Petersburg	0	------	0	0	1	1	0	0	0	2	14
Tampa	1	------	0	0	2	0	0	2	0	4	32
Kentucky:											
Ashland	1	------	0	0	0	0	0	0	0	2	8
Covington	0	------	0	0	2	1	0	2	0	0	14
Lexington	0	------	0	0	0	0	0	1	0	0	12
Louisville	0	------	0	2	3	22	0	2	0	16	71
Tennessee:											
Knoxville	1	------	0	0	2	1	0	3	0	0	28
Memphis	2	------	1	0	0	6	0	1	0	7	72
Nashville	6	------	0	0	1	2	0	3	0	4	45
Alabama:											
Birmingham	0	1	0	0	0	9	0	3	0	2	65
Mobile	1	------	0	0	1	0	0	0	0	0	30
Montgomery	0	------	------	0	------	1	0	------	0	0	------
Arkansas:											
Fort Smith	1	------	------	0	------	0	0	------	0	0	------
Little Rock	0	1	0	0	1	0	0	3	0	0	27
Louisiana:											
Lake Charles	1	------	0	0	0	0	0	0	0	0	2
New Orleans	5	2	1	1	9	1	0	4	2	3	103
Shreveport	0	------	0	0	2	0	0	1	0	0	32
Oklahoma:											
Oklahoma City	1	1	0	0	4	2	0	3	0	0	36
Tulsa	1	------	0	6	0	1	0	0	1	1	7

City reports for week ended Oct. 18, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Texas:											
Dallas	8		0	2	1	1	0	0	0	0	50
Fort Worth	1		0	0	3	1	0	0	0	3	29
Galveston	0		0	0	1	1	0	1	0	0	14
Houston	0		0	0	5	1	0	5	0	6	78
San Antonio	0	7	2	0	3	4	0	7	1	1	60
Montana:											
Billings	1		0	0	1	0	0	0	0	0	8
Great Falls	0		0	0	0	4	0	0	0	3	6
Helena	0		0	0	0	1	0	0	0	0	2
Missoula	0		0	0	0	0	0	0	0	0	2
Colorado:											
Colorado Springs	0		0	0	1	0	0	0	0	0	6
Denver	5	12	0	11	5	4	0	1	0	48	67
Pueblo	0		0	1	1	2	0	1	0	6	11
New Mexico:											
Albuquerque	0		0	0	4	0	0	1	0	6	12
Utah:											
Salt Lake City	0		0	1	0	2	0	0	0	4	38
Washington:											
Seattle	0		0	0	4	0	0	2	0	18	85
Spokane	0		0	0	1	3	0	1	0	9	30
Tacoma	0		0	1	0	4	0	0	0	3	27
Oregon:											
Portland	0	3	1	1	2	0	0	4	0	0	53
Salem	0	1		0		1	0		1	0	
California:											
Los Angeles	10	7	0	14	4	15	0	11	0	37	326
Sacramento	2		0	0	0	1	0	0	0	0	29
San Francisco	0		0	1	6	8	0	6	0	6	184

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	1	0	8
Rhode Island:			
Pawtucket	0	0	1
Providence	0	0	1
Connecticut:			
Hartford	0	0	1
New York:			
Buffalo	1	0	0
New York	0	0	16
Syracuse	0	0	5
Pennsylvania:			
Philadelphia	0	0	9
Pittsburgh	0	0	3
Reading	0	0	1
Ohio:			
Cleveland	0	0	4
Indiana:			
Fort Wayne	0	0	2
Illinois:			
Chicago	1	0	0
Michigan:			
Detroit	0	0	3
Flint	0	0	1
Wisconsin:			
Madison	0	0	1
Minnesota:			
Duluth	0	0	1
Minneapolis	0	1	4
St. Paul	0	0	6
Missouri:			
St. Joseph	1	0	0
St. Louis	0	0	1
North Dakota:			
Fargo	0	0	1
Kansas:			
Wichita	0	0	1
Maryland:			
Baltimore	1	0	2
District of Columbia:			
Washington	0	0	4
Virginia:			
Richmond	1	0	0
South Carolina:			
Charleston	0	0	1
Tennessee:			
Knoxville	0	0	1
Nashville	0	0	3
Alabama:			
Birmingham	0	0	1
Louisiana:			
Shreveport	0	1	0
Texas:			
San Antonio	0	0	1
Utah:			
Salt Lake City	0	1	0
Washington:			
Seattle	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Springfield, Mass., 1; Syracuse, 1; Minneapolis, 3; Salem, Oreg., 1.

Pellagra.—Cases: Atlanta, 1; Savannah, 1; Birmingham, 1.

Rabies in man.—Deaths: Mobile, 1.

Typhus fever.—Cases: New York, 2; Charleston, S. C., 1; Atlanta, 2; Savannah, 2; Tampa, 2; Mobile, 1; Montgomery, 1; Lake Charles, 1; New Orleans, 1; Houston, 1; Los Angeles, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,845,176)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Oct. 18, 1941	14.79	7.55	1.69	22.19	33 74	66.86	0.00	42.06	3.70	152 83
Average for week, 1936–40	21.18	10.74	3.58	52.47	58.86	90.93	0.62	49.36	6.70	146 83

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS IN SISKIYOU COUNTY, CALIF.

Under date of October 22, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in a pool of 145 fleas from 5 ground squirrels, *C. douglasii*, submitted to the laboratory on September 13 from the right-of-way of the Southern Pacific Railway inside the city limits of Mount Shasta City, Siskiyou County, Calif.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on October 2, 1941, about a mile from Honokaa village in the Kapulena area, Hamakua District, Island of Hawaii, T. H.. has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 27, 1941.—During the week ended September 27, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		5		4	6			1	1	17
Chickenpox		6		47	97	38	2		31	221
Diphtheria		21		28		4	3			56
Dysentery				5	2					7
Influenza					9	2			11	22
Lethargic encephalitis						9	[1] 11	13	2	35
Measles		2		121	39	2	3	3	4	174
Mumps				115	52	10	10	2	31	220
Pneumonia		1			12					13
Poliomyelitis		2	20	3	5	15	3	4	5	57
Scarlet fever		11	4	65	87	19	12	6	6	210
Trachoma							1			1
Tuberculosis	11	2	4	90	43	8				158
Typhoid and paratyphoid fever			1	34	8	3	12		2	60
Whooping cough		3		170	68		9	3	13	266

[1] Encephalomyelitis.

COSTA RICA

Communicable diseases—September 1941.—During the month of September 1941, certain communicable diseases were reported in Costa Rica as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	29	4	Scarlet fever	5	
Influenza	200	2	Typhoid and paratyphoid fever	7	3
Poliomyelitis	1				

SCOTLAND

Vital statistics—Quarter ended March 31, 1941.—Following are provisional vital statistics for Scotland for the quarter ended March 31, 1941:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	10,751	8.5	Deaths from—Con.		
Births	22,253	17.6	Influenza	478	0.40
Deaths	23,332	19.2	Lethargic encephalitis	6	
Deaths under 1 year of age	2,435	[1] 109	Measles	67	.06
Deaths from:			Nephritis, acute and chronic	432	
Appendicitis	92		Pneumonia (all forms)	1,580	1.31
Cancer	2,064	1.72	Poliomyelitis	10	
Cerebral hemorrhage and apoplexy	1,360		Puerperal sepsis	40	
Cerebrospinal fever	128	.10	Scarlet fever	6	.005
Cirrhosis of the liver	34		Senility	755	
Diabetes mellitus	208		Suicide	93	
Diarrhea and enteritis (under 2 years of age)	178		Syphilis	64	
Diphtheria	187	.16	Tetanus	1	
Dysentery	13		Tuberculosis (all forms)	1,157	.95
Erysipelas	9		Typhoid and paratyphoid fever	5	.004
Heart disease	5,270		Whooping cough	324	.27
Homicide	8				

[1] Per 1,000 live births.

NOTE.—All deaths given in the above table are for civilians only.

RECENT GERMAN AND CZECH VITAL STATISTICS

The following vital statistics for Germany (old Reich) and the area termed the "former Czech Territories" have recently been issued officially by the German Government:

Rates per 1,000 population

	Marriages	Live births	Stillbirths	Total deaths	Deaths under 1 year per 1,000 live births
January-May 1941:					
German	8.5	18.2	0.4	14.1	73
Czech	7.6	17.9	0.4	15.1	118
January-May 1940:					
German	11.0	22.5	0.5	15.4	72
Czech	9.6	17.5	0.4	15.3	114

BIRTH RATE AND SUBSIDIES IN GERMANY

According to official figures, the number of marriages in the old Reich increased from 517,000 in 1932 to 772,000 in 1939, and birth rates from 14.7 per 1,000 population in 1933 to 20.3 in 1939.

Various types of loans and subsidies are granted by the Government to encourage large families. Since August 1933, 1,800,000 marriage loans have been made; since October 1935, 1,100,000 subsidies have been granted for the birth of a child in families already having 3 or

more children, and since 1938, 400,000 educational grants have been made and 180,000 equipment subsidies granted. In addition, 2,500,-000 families receive monthly subsidies for 5,000,000 children. To September 1941, three billion marks had been paid in these subsidies and beginning with the present fiscal year they are expected to total one billion annually.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Belgian Congo.—From the beginning of July to August 2, 1941, 21 fatal cases of pneumonic plague occurred in the villages of Taratibu and Mandombele, near Blukwa, in addition to a fatal case of bubonic plague which occurred in Blukwa. During the week ended August 9, 1941, 1 death suspected of being due to bubonic plague was reported in the village of Busianga, near Lubero.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Amazonas State—Manacapuru, Aug. 13, 1 death; Para State—Iritua, Aug. 19, 1 death; S. Miguel do Guama, Sept. 4, 1 death; S. Sebastiao Boa Vista, Aug. 21, 1 death.

Colombia.—Yellow fever has been reported in Colombia as follows: Intendencia of Meta—San Martin, Sept. 15, 1 death; Villavicencio, Sept. 25, 1 death; Santander Department—Bolivar, Sept. 11, 1 death, Sept. 14, 1 death; San Vincente de Chucuri, Sept. 28, 1 death.

Sudan (French)—Bamako Circle—Kati.—On October 26, 1941, 1 case of suspected yellow fever was reported in Kati, Bamako Circle, French Sudan.

COURT DECISIONS ON PUBLIC HEALTH

Habitual criminal sterilization act upheld.—(Oklahoma Supreme Court; *Skinner* v. *State ex rel. Williamson, Atty. Gen.*, 115 P.2d 123; decided February 18, 1941, rehearing denied July 8, 1941.) The "Oklahoma Habitual Criminal Sterilization Act", enacted pursuant to the police power of the State, defined an "habitual criminal" as a person who had been convicted two or more times to final judgment of crimes amounting to felonies involving moral turpitude either in a court of competent jurisdiction of Oklahoma or of any other State and who was thereafter convicted to final judgment in a court of

competent jurisdiction of Oklahoma of a crime amounting to a felony involving moral turpitude and sentenced to imprisonment in a State penitentiary, reformatory, or other like penal institution. There were excepted from the act persons convicted of offenses arising out of the violation of the prohibitory laws and revenue acts, embezzlement, or political offenses. The statute provided for a proceeding against a person having the status of an habitual criminal and, among other things, stated that, if the court or jury, as the case might be, found the defendant to be such an habitual criminal and that said defendant could be rendered sexually sterile without detriment to his or her general health, the court should render judgment that the defendant be rendered sexually sterile.

In the instant case, under the findings of a jury, the lower court ordered sterilization and an appeal was taken to the Supreme Court of Oklahoma. The appellant assailed the constitutionality of the act and the court first considered the claims that the act (*a*) inflicted cruel and unusual punishment, (*b*) constituted a bill of attainder, and (*c*) was an ex post facto law. As the constitutional inhibitions here involved had reference only to punishment for crime, these claims were, according to the court, upon the premise that the act was a penal law and that sterilization was inflicted as a punishment, and the decisive question in connection with the determination of the objections was whether the act was a penal statute or a eugenic measure. The view taken by the supreme court was adverse to the appellant, the court saying that it thought that "it was the intention of the legislature that this act should be a eugenic measure to improve the safety and general welfare of the race by preventing from being born persons who will probably become criminals."

The next contention was that the act violated the due process clause of both the State and Federal constitutions. The objection made was that the act did not require a finding by the court or jury that by the laws of heredity the appellant was the probable potential parent of children with criminal tendencies, and it was argued that he was thereby deprived of a full hearing. The court said that the question was whether the statute was "a reasonable exercise of the police power in providing that all habitual criminals as therein defined shall be sterilized, for if it is proper to enact such a provision the procedural aspects are satisfied." The determination, said the court, of the reasonableness of the act's provisions as an exercise of the police power was based upon the question of fact of whether habitual criminals as defined possessed an inheritable tendency to crime which would be passed on to their children if they were allowed to procreate. If that were true then the act bore a real relation to the public welfare, but if it were not true the act would encroach upon the constitu-

tional rights of individuals without justification. The court stated that it had to assume that the legislature had before it statistics, scientific works, and information from which it found as a fact that habitual criminals were more likely than not to beget children of like criminal tendencies who would probably become a burden upon society. "Every presumption must be indulged in favor of the existence of facts which the legislature assumed and acted upon, and we are not at liberty to strike down the act unless we can say beyond a reasonable doubt that the legislature was clearly in error, and was wholly unwarranted and acted arbitrarily, in assuming or determining such facts." The court found nothing in the record that justified a finding that the legislature was clearly and beyond a reasonable doubt in error in assuming facts justifying the act as a proper exercise of the police power and said that its knowledge on the subject was not superior to that of members of the legislature. The contention of the appellant relative to due process of law was disposed of adversely to him.

The final claim that the act denied the appellant equal protection of the law in violation of the State and Federal constitutions was also decided against him. The court pointed out that the test of equal protection of the law was dependent upon the reasonableness of the classification and stated that it appeared that the classification in the instant case was reasonable as the act applied to all habitual criminals as therein defined whether incarcerated in an institution or not.

The judgment of the trial court was affirmed.

Payment for services performed by superintendent of county board of health.—(South Dakota Supreme Court; *Donahoe* v. *Minnehaha County*, 299 N.W. 238; decided July 3, 1941.) An action was brought by the plaintiff to recover for services performed by him as superintendent of a county board of health. The county had disallowed claims of the plaintiff based upon the making of routine examinations of school houses throughout the county. The judgment of the trial court was in favor of the defendant county and the plaintiff appealed to the supreme court.

The latter court referred to a statute which provided that a county board of health "shall have original power to inquire into sanitary conditions of school houses within the county, and upon complaint and investigation shall have power to abate any insanitary conditions that may be found to exist." "In order," said the court, "that 'original power' may be exercised there must be some action by the board itself. * * * Clearly the superintendent must receive some authority from the board of which he is a member before the investigations and services are rendered." It was pointed out that the rec-

ord disclosed that none of the items for which the plaintiff sought recovery was authorized or directed to be done at any meeting of the county board of health and that there had been no authorization or direction by the board or anyone to incur the services, mileage, and expenses. Also, the record was silent as to the report of any immediate emergency. On account of the foregoing, the court did not believe that the plaintiff's claims should be allowed.

Public Health Reports

VOLUME 56 **NOVEMBER 14, 1941** NUMBER 46

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56 • NOVEMBER 14, 1941 • *No. 46*

PAN AMERICAN HEALTH DAY

For some time representative public health men of the different American Republics have pointed out the desirability of setting aside a day for the commemoration on a Pan American scale of the health activities of the past, and for emphasizing present problems and the work in progress.

This idea was put forward at the Tenth Pan American Sanitary Conference (Bogotá, Colombia, 1938), and afterward more formally discussed at the Fourth Pan American Conference of National Directors of Health (Washington, D. C., May 1940), at which time a resolution for the celebration of such a day was adopted.

In keeping with this resolution, the President of the United States, in November 1940, issued the following proclamation designating December 2, the date selected by the Pan American Directors of Health, as Pan American Health Day.

A PROCLAMATION BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

WHEREAS the Fourth Pan American Conference of National Directors of Health, held in Washington in May 1940, adopted a resolution recommending "that a 'Health Day' be held annually in the countries of the Pan American Union"; and

WHEREAS the National Health Authorities of the American Republics have agreed upon the second day of December 1940, as the date for the first celebration of Pan American Health Day, inasmuch as this is the anniversary of the opening date of the First Pan American Sanitary Conference, in 1902, marking the beginning of inter-American cooperation in one of the fields most important to progress, civilization, and the general well-being—that of public health; and

WHEREAS the Director of the Pan American Sanitary Bureau and the Surgeon General of the United States Public Health Service have requested that the United States Government and the people render their fullest cooperation and support to this new demonstration of the unity of interests and ideals of the countries of the Western Hemisphere:

NOW, THEREFORE, I, FRANKLIN D. ROOSEVELT, President of the United States of America, do hereby designate the second day in December of this and of each succeeding year as Pan American Health Day, and do hereby call upon the citizens of our country to celebrate the day appropriately, do invite similar action

on the part of the Governors of the several States, Territories, and island possessions of the United States, and, in order that our people may become better informed concerning the importance of Pan American cooperation in the field of public health and of the work which has been and is being done in this field, do invite the medical, sanitary, dental, pharmaceutical and nursing professions, the scientific groups, all organs of opinion, including the press, radio, and the motion picture industry, and all agencies and individuals interested in health, and especially public health and school authorities, to join with each other and with similar bodies in our sister Republics in the celebration of Pan American Health Day, thus emphasizing once more the ties that bind our countries together.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States of America to be affixed.

DONE at the City of Washington this 23d day of November, in the year of our Lord nineteen hundred and forty, and of the Independence of the United [SEAL] States of America the one hundred and sixty-fifth.

FRANKLIN D. ROOSEVELT

By the President:
SUMNER WELLES
Acting Secretary of State.

Similar resolutions and decrees were issued by all the American Republics.

The celebration is in general on a threefold basis: Commemoration of Pan American public health cooperation, medical progress, and public health workers of the past; emphasis on problems and activities of the present, often with such concrete demonstrations as visits to public health clinics and the opening of new public health centers; and announcement of plans for the future. The date selected, December 2, is that of the opening of the First Pan American Sanitary Conference in 1902, thus marking the beginning of an international cooperation which has become ever more firmly established, which has achieved much in the past and promises to achieve more in the future.

The ceremonies in the various countries include such different types of celebrations as special meetings and lectures in all countries; radio broadcasts in at least 10 countries (Costa Rica, Cuba, Chile, Dominican Republic, Ecuador, Guatemala, Haiti, Nicaragua, Uruguay, and Venezuela); in Colombia, a visit to the tombs of the great sanitarians of the past, and awarding of decorations to a group of those of the present; in Costa Rica, issue of a special series of postage stamps and inauguration of a Museum of Hygiene; in Guatemala, unveiling of a bronze plaque in the building of the Department of Health, on which are engraved the names of the President of the Republic, General Jorge Ubico, Mr. John D. Rockefeller, and Dr. Hugh S. Cumming, Director of the Pan American Sanitary Bureau; in Haiti, religious ceremonies, and a Presidential address over the radio; in Chile, radio broadcasts, lectures, and movies; in Colombia, Mexico, and Peru,

special sessions of the National Academies of Medicine; in Guadalajara, Mexico, offering of free consultations to the public by the medical profession; in Nicaragua, opening of a health center; in Paraguay, declaration of December 2 as a national holiday; in Peru, an official program in the auditorium of the Ministry of Public Health, Labor and Social Welfare, attended by the President of the Republic, opening of the Workers' Hospital of Lima, and other celebrations; in the United States, messages from the health officers to their colleagues in other Republics, offers on the part of the principal scientific societies of their best cooperation in Pan American work, and special programs in medical schools; in Uruguay, a reception given by the Ministry of Health, and radio program; and in Venezuela, opening of all health offices to the public, with explanations of the services offered therein.

In honor of Pan American Health Day, the Pan American Sanitary Bureau is issuing a special number of its Bulletin, containing messages from the Directors of Health of the various Latin American Republics and the United States, as well as other pertinent matter. It has also prepared a Pan American public health quiz for distribution to medical students.

BLINDNESS, AS RECORDED IN THE NATIONAL HEALTH SURVEY—AMOUNT, CAUSES, AND RELATION TO CERTAIN SOCIAL FACTORS [1]

By Rollo H. Britten, *Senior Statistician, United States Public Health Service*

CONTENTS

INTRODUCTION

In the National Health Survey,[2] special consideration was given to the subject of blindness, this item being carried on the schedule form. A record was made of the presence of this impairment (both eyes and one eye only) in the canvassed population, the cause of the condition, and other pertinent data. Since the survey included questions on certain population and social characteristics, it has been possible to arrive at a comprehensive picture of the prevalence of

[1] From the Division of Public Health Methods, National Institute of Health. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Projects Nos. 712159-658/9999 and 765-23-3-10.

[2] For a description of the scope, method, and general definitions of the National Health Survey, see The National Health Survey: Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting. By George St. J. Perrott, Clark Tibbitts, and Rollo H. Britten. Pub. Health Rep., 54: 1663 (1939). Reprint No. 2098.

blindness in various population groups. That is the primary purpose of the present article.[3]

The National Health Survey was a house-to-house canvass of 703,092 urban families in 18 States (and 36,801 families in certain rural areas) made to determine the frequency of serious disabling illness, medical care received in connection with such illness, and the relation of these items to social and economic conditions. The survey was patterned on previous ones conducted by the United States Public Health Service and in general followed the established techniques developed in such surveys, information being collected by trained enumerators from the housewife or other responsible member of the household. The data were obtained (usually) by means of a single visit to each household, visits being made from November 1935 to March 1936. The present analysis is confined to 2,498,180 white and colored persons (of known ages) in surveyed urban areas. The urban sample was chosen to be representative in general of cities in the United States according to geographic region and size. In large cities (100,000 or more population in 1930) the households to be canvassed were determined by a random selection of many small districts based on those used in the United States Census of 1930. In the smaller cities selected for study the population was enumerated completely. The surveyed urban population totalled 2,502,391 persons. (The rural sample covered 16 counties in Georgia, 4 in Michigan, and 3 in Missouri, with a total surveyed population of 140,418.) It is the extent of the National Health Survey that lends particular value to the findings on blindness, since the numbers encountered in previous studies have been insufficient to permit adequate comparisons.

As enumerated in the Health Survey, the blind represent persons with vision impaired to a degree which the lay informant considered blindness. The enumerator made no query concerning persons with defective vision of severe degrees not designated as blindness; i. e., the burden of reporting was placed on the family informant. The enumerator was not expected to elicit additional information by use of questions concerning ability to read or distinguish objects, etc.

Specific instructions to the enumerator were as follows:

If a person is blind, indicate whether the blindness is in one eye or in both eyes by entering "Yes" in *one* of the two allotted spaces. Do not ask if anyone is partially blind, but enter it (indicating by "Yes" in the allotted space) when that information is voluntarily given you. Defective vision, unless causing almost complete blindness, is not included.

It may be assumed, therefore, that the cases of blindness (both eyes) recorded in the Health Survey represent persons who were

[3] A preliminary report on blindness was prepared by Kenneth W. Revell of the Health Survey staff: The National Health Survey: Blindness—amount, causes, and relation to certain social factors. Preliminary Reports, Sickness and Medical Care Series, Bulletin No. 10. National Institute of Health, Division of Public Health Methods, Washington, D. C., 1938.

totally blind or had vision sufficient merely to distinguish between light and dark. Even for this group the figures are to be considered a minimum, both because of the recognized incompleteness of data obtained in general studies of the character of the Health Survey and the exclusion of most institutionalized cases.[4]

A separate entry was made on the schedule for blindness in one eye only, and this category yields data of a novel and important nature. The figures must be regarded as an understatement, but of value from a relative point of view.

The category "partial blindness," although it lacked specificity and therefore does not constitute a group properly subject to statistical analysis, served the purpose for which it was intended, namely, to prevent the inclusion under the "blind" of many persons who had seriously defective vision but were able to use their eyes for certain purposes. Among the 2,498,180 white and colored persons of known ages, there were 4,896 cases of partial blindness recorded, as against 2,068 for blindness in both eyes and 8,137 for blindness in one eye only. Because of the absence of any precise definition of "partial blindness" and the fact that the enumerator was instructed not to inquire in regard to it, this group has been omitted from consideration in this report.

GROSS PREVALENCE [5]

The number of persons per 100,000 recorded as being blind in both eyes (in the urban population surveyed) was 83, the number blind in one eye only 326, and the number blind in one or both eyes 409. [6]

SEX AND AGE

The prevalence of blindness [7] was greater among males than among females, as is shown in table 1, the difference being particularly marked for blindness in one eye only. As will be brought out later, these differences are associated with a higher rate of blindness due to

[4] There were 18 persons, blind in both eyes, recorded as being in institutions for the care of disease for the entire 12 months immediately preceding the visit.

[5] The term "prevalence" is used in this article to express the proportion of any population group who were reported as blind at the time of the Health Survey.

[6] No representative figures can be given for the rural population (i. e., persons living in places of less than 2,500 population) because of the fact that the surveyed rural areas cannot be regarded as an adequate sample of rural United States. However, the gross prevalence rates are given as a point of interest:

	Rate per 100,000		
	Both eyes	1 eye only	1 or both eyes
Michigan—rural parts of 4 counties	109	685	794
Missouri—rural parts of 3 counties	157	722	879
Georgia—16 counties	100	380	480

[7] When not qualified, the terms "the blind" and "blindness" are to be understood as referring to groups comprising persons who were either blind in both eyes or were blind in one eye only.

accidents among males than among females (however, see discussion at the end of this section relative to differences in incidence rates by sex).

TABLE 1.—*Prevalence of blindness according to sex*

Sex	Rate per 100,000			Number of cases			Population
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes	
Both sexes	83	326	409	2,068	8,137	10,205	2,498,180
Male	87	444	531	1,045	5,332	6,377	1,200,728
Female	79	216	295	1,023	2,805	3,828	1,297,452

The concentration of the blind in the higher age groups is indicated in table 2. It will be noted that more than one-fourth of all the blind (both eyes) recorded in the Health Survey were over 75 years of age; that two-thirds were over 55 years of age; and that practically all were past or within the working ages.

TABLE 2.—*Percentage distribution and prevalence of blindness according to age*

Age (years)	Percentage distribution			Rate per 100,000			Number of cases	
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only
All ages	100.0	100.0	100.0	83	326	409	2,068	8,137
Under 15	3.4	5.5	5.1	12	75	86	71	430
15–24	3.1	7.4	6.5	15	134	149	65	599
25–34	5.5	9.2	8.5	27	177	203	114	751
35–44	9.4	15.0	13.9	49	308	358	195	1,220
45–54	13.2	16.7	16.0	90	449	539	274	1,360
55–64	16.5	16.1	16.2	187	718	905	342	1,312
65–74	22.6	17.2	18.3	458	1,372	1,830	468	1,402
75–84	18.5	10.4	12.0	1,096	2,418	3,514	382	843
85 and over	7.6	2.5	3.5	2,916	3,714	6,630	157	200

The proportion of persons at any age who were blind is also presented in the table (and is shown graphically in fig. 1). Among children (persons under 15 years of age) the rate was 12 per 100,000 for blindness in both eyes and 86 per 100,000 for blindness in one or both eyes. In each succeeding age group there was found a marked increase in the rate, which reached the extreme figure of 2,916 (both eyes) and 6,630 (one or both eyes) among persons 85 or more years of age.

Since few blind persons recover their sight, the curves in figure 1 for both eyes and for one or both eyes may be taken as representing the accumulation of blind persons in the living population during the attained lifetime. If it be assumed that, over a period of years, there has been no material change in the prevalence of blindness at specific ages and that the mortality rate of the blind does not differ very greatly from that of the total population, an estimate can be made of the rate of development of new cases of blindness at specified

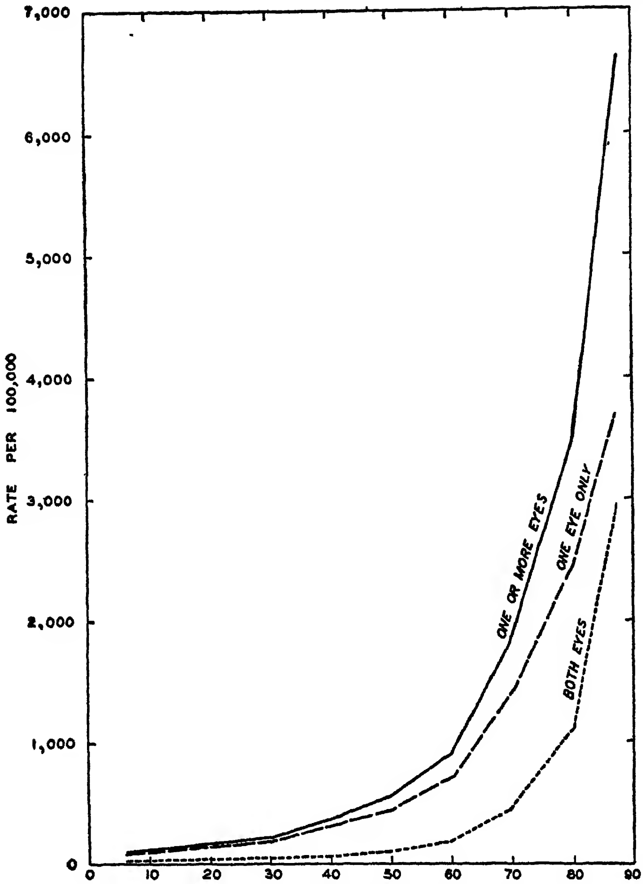


FIGURE 1.—Prevalence of blindness, according to age.

ages. For instance, the prevalence rate of 49 in table 2 for the age group 35–44 would indicate that 49 persons in each 100,000 had become blind (both eyes) by the time they had reached about 40 years of age. Similarly the rate of 90 for the age group 45–54 would indicate that 90 persons in each 100,000 had become blind by the time they reached about 50 years of age. Then the difference between these rates (41) gives the number per 100,000 who became blind during the 10-year period during which they were between 40 and 50 years of age. The average annual frequency of new cases for this age group (40–49) would be obtained by dividing the 41 by 10 (the number of years in the period).[8] A similar calculation for each age group results in the series of figures presented in table 3.[9]

[8] The term "incidence" will be used in this article to distinguish this type of rate from that of prevalence. (See footnote 5.)

[9] Incidence rates are not presented for one eye only. For this group the assumptions made in the text do not hold, since persons may shift from the group blind in one eye only to that blind in both eyes.

TABLE 3.—*Estimated annual incidence of new cases of blindness per 100,000 persons, according to age*

Age (years)	Both eyes	1 or both eyes	Age (years)	Both eyes	1 or both eyes
All ages	6.6	23.6	40–49	4.1	18.1
			50–59	9.7	36.6
Under 7½	[1] 1.6	11.5	60–69	27.1	92.5
7½–19	.22	5.0	70–79	63.8	168.4
20–29	1.2	5.4	80–89	182.0	311.6
30–39	2.2	15.5			

[1] Congenital and hereditary causes are, of course, included.

The incidence rate for all ages combined is reached by weighting the age specific rates by the population in each age group.[10]

This approximation yields an estimated annual incidence of new cases of blindness (both eyes) of 6.6 per 100,000 population. It will be seen that the rate of development of new cases increased very rapidly with age.

The prevalence of blindness according to sex and age is shown in table 4 and figure 2. In order that the relative differences may be

TABLE 4.—*Prevalence of blindness according to sex and age*

Age (years)	Rate per 100,000						Number of cases			
	Both eyes		1 eye only		1 or both eyes		Both eyes		1 eye only	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
All ages	87	79	444	216	531	295	1,045	1,023	5,332	2,805
Under 15	14	10	94	55	108	65	42	29	285	165
15–24	21	9	202	76	223	85	43	22	417	182
25–34	34	21	263	102	297	123	67	47	518	233
35–44	62	37	472	155	535	192	119	70	903	317
45–54	105	76	647	251	752	327	159	115	980	380
55–64	213	163	960	495	1,173	658	187	155	841	471
65–74	522	405	1,790	1,025	2,311	1,430	242	226	830	572
75–84	942	1,213	3,060	1,930	4,002	3,143	142	240	461	382
85 and over	2,010	3,536	4,431	3,223	6,441	6,758	44	113	97	103

more clearly indicated, the vertical scale of the chart has been arranged in accordance with the logarithms of the rates. It will be noted that the males showed a higher prevalence of blindness in both eyes up to about 75 years of age; above that age the prevalence was greater among females. Blindness in one eye only showed much greater relative differences by sex, and the rate for males was greater than that for females in each age group without exception.

As in the case of the rates for both sexes combined, a calculation of the estimated annual incidence of new cases was made for the two sexes separately. The result is shown in table 5. Perhaps of chief

[10] I. e., by determining the estimated number of cases in each age group $\left(\frac{\text{rate times population}}{100,000}\right)$, adding the cases together, and dividing the total (× 100,000) by the population for all ages.

interest is the fact that the annual incidence of new cases of blindness (both eyes), all ages combined, is greater for females than for males—this phenomenon offering a contrast with the prevalence figures. The apparent contradiction is due to the fact that differences between the sexes in the incidence of new cases at the younger ages have a relatively greater effect on the prevalence figures than differences at the older ages.[11] In the case of blindness in one or both eyes, although both the incidence and prevalence rates are greater for males, the excess is much greater in the latter case. The ratio of the rate for

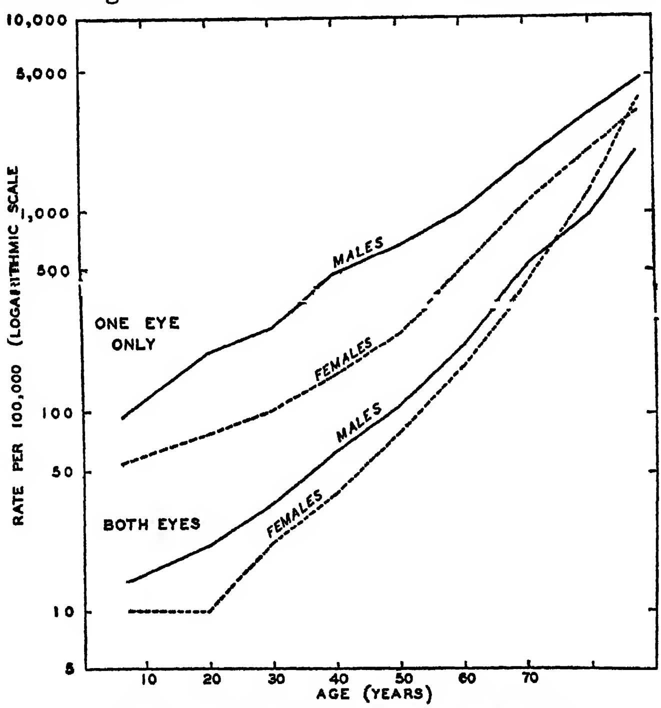


FIGURE 2.—Prevalence of blindness, according to sex and age.

males to that for females was 1.8 for the prevalence data and 1.4 for the incidence data.

Males showed a higher annual incidence of new cases in both eyes up to about 70 years of age; above that age the incidence was greater among females. The incidence of blindness in one or both eyes showed much greater relative differences by sex. Unlike the prevalence data, the rate for blindness in one or both eyes among females exceeded the rate among males in the advanced ages.

CAUSES OF BLINDNESS

The enumerator was instructed to inquire as to the cause of the blindness. As was to be expected, in many instances the family did

[11] The corresponding rates adjusted to the age composition of the total urban surveyed population are: Prevalence, male 89, female 76; incidence, male 6.2, female 6.9.

not know what the cause was and sometimes was undoubtedly mistaken. However, as a first approximation, the information on causes of blindness is regarded as being sufficiently reliable to be of great interest and value. The point is to be made again that the cases are an accumulation over the attained lifetime of the population. In regard to cause they may not be representative of new cases of blindness occurring today.

TABLE 5.—*Estimated annual incidence of new cases of blindness per 100,000, according to sex and age*

Age (years)	Both eyes		1 or both eyes	
	Male	Female	Male	Female
All ages	6.0	7.2	27.9	19.9
Under 7½	1.8	1.3	14.4	8.6
7½-19	.56	.48	9.2	1.6
20-29	1.3		7.4	3.8
30-39	2.8	1.6	23.8	6.9
40-49	4.3	3.9	21.7	13.5
50-59	10.8	8.7	42.1	33.1
60-69	30.9	24.2	115.8	77.[illegible]
70-79	[illegible]	80.[illegible]	160.1	171.3
80-89	106.8	232.3	243.9	361.5

In figure 3 is presented the percentage distribution of cases of blindness classified according to certain broad cause groups. Since cases with no cause reported are much more likely to be due to disease than to accident, and since blindness is sometimes erroneously ascribed to accidents because they occurred at a time when blindness due to disease had first become manifest, it may be felt that the percentages given in the chart for accident causes are not too low and may actually be somewhat too high. Accident was recorded as the cause in one-sixth of the cases of blindness in both eyes and in one-half of the cases of blindness in one eye only. The remainder—five-sixths for blindness in both eyes and one-half for blindness in one eye only—may perhaps be ascribed to disease and to congenital causes or causes associated with early infancy. It is difficult to say how far the latter causes are underrepresented in the percentages given in figure 3, but the difficulty of drawing a sharp line here is evident.

In table 6 the cases caused by disease have been classified in such detail as seems justified by the source and type of the information.[12] Cataract, glaucoma, or other diseases of the eye were recorded as the cause in more than half of the cases of blindness reported as due to disease. Degenerative disease was the major cause for diseases which did not originate in the eye. A somewhat different picture was presented for blindness in one eye only than for both eyes, cataract having a relatively more important role in the former case.

[12] Acknowledgment is made to Ralph E. Wheeler, Surgeon (R), U. S. Public Health Service, for assistance in making this classification.

Comment is to be made on the fact that syphilis and gonorrhea do not appear in the list of diseases given as causes. Although it is recognized that these diseases have been and are responsible for many cases of blindness it was to be expected that, because of the nature of the survey, in only a few cases would a venereal disease be given as the cause of blindness.

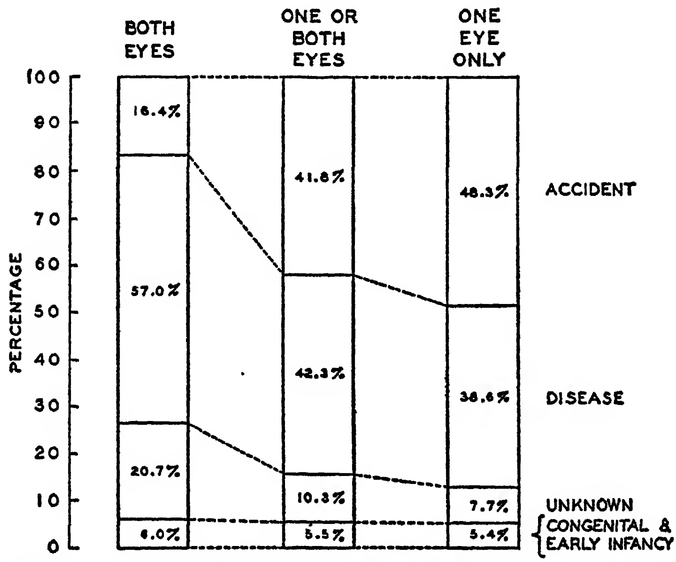


FIGURE 3.—Percentage distribution of cases of blindness according to broad cause groups (cases caused by nonaccidental injuries excluded).

TABLE 6.—*Percentage distribution and prevalence of blindness according to disease cause*

Disease cause	Percentage			Rate per 100,000		
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes
All disease causes	100.0	100.0	100.0	47.1	124.7	171.8
Cataract	33.5	41.1	39.0	15.8	51.2	67.0
Glaucoma, etc.[1]	18.0	12.0	13.7	8.5	15.0	23.5
Ocular infections	3.2	5.1	4.5	1.5	6.3	7.8
Tumors [2]	1.3	3.1	2.6	.6	3.9	4.5
Localized infections (except ocular)	2.1	6.5	5.3	1.0	8.1	9.1
General infectious diseases	10.6	10.7	10.7	5.0	13.4	18.4
Degenerative diseases	23.1	15.2	17.4	10.9	19.0	29.9
Occupational hazards	1.9	1.6	1.7	.9	2.0	2.9
Ill-defined diseases	6.2	4.7	5.1	2.9	5.8	8.7

[1] Includes noninfectious eye diseases except cataract.
[2] Malignant or benign.

Whenever blindness was recorded as due to an accident, the enumerator was required to record the place where the accident occurred (home, in a public place, at work) and also whether a motor vehicle was involved. In table 7 the cases of blindness recorded as due to accident have been so classified.

TABLE 7.—*Percentage distribution and prevalence of blindness due to accident according to place of occurrence of the accident*

Place of accident	Percentage			Rate per 100,000		
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes
All accident causes	100.0	100.0	100.0	13.5	156.1	169.6
Home	24.3	35.0	34.1	3.3	54.6	57.9
Public:						
Motor vehicle	10.4	5.6	6.0	1.4	8.8	10.2
Other	16.0	15.2	15.3	2.2	23.8	26.0
Occupational	38.2	37.0	37.1	5.2	57.8	63.0
Unspecified place	11.2	7.1	7.4	1.5	11.1	12.6

More than a third of the cases of blindness due to accident (either both eyes or one eye only) were recorded as having resulted from occupational accidents. As stated, the figures represent an accumulation over the attained lifetime of the population and do not necessarily reflect conditions under which new cases of blindness arise today.

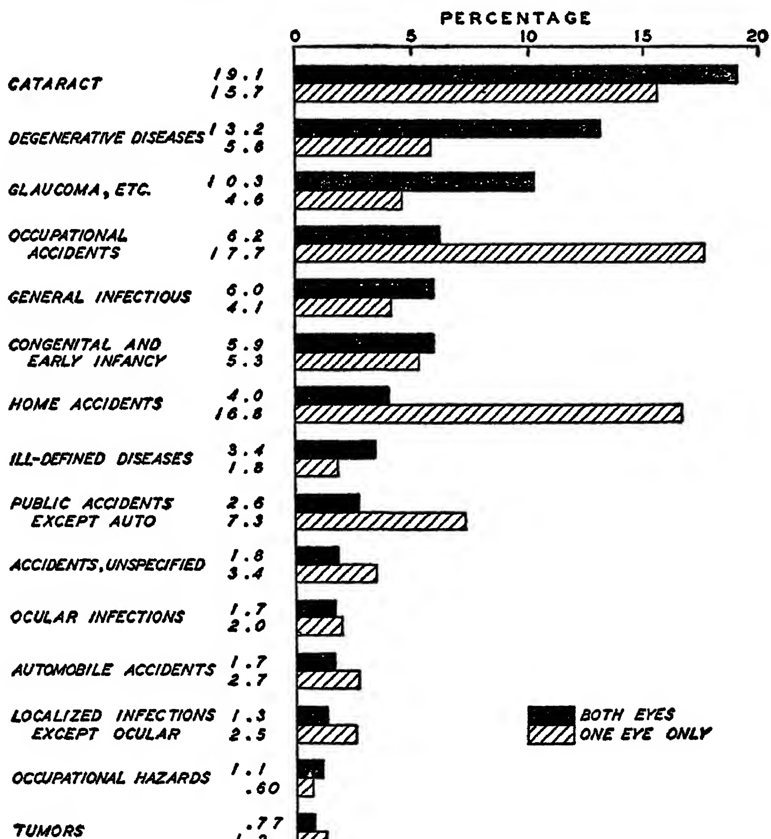


FIGURE 4.—Percentage distribution of cases of blindness according to specific cause for (*a*) both eyes and (*b*) one eye only.

The importance of home accidents in producing blindness has not been sufficiently appreciated. A fourth of all cases of blindness in both eyes and a third of all cases in one eye only which were caused by accidents were due to home accidents.

The data on motor vehicle accidents resulting in blindness must be viewed in the light of the fact that this hazard is relatively new. If it had existed throughout the lifetime of all the persons surveyed, the percentages due to this cause would be considerably greater.

By way of summary, figure 4 gives the percentage of blindness

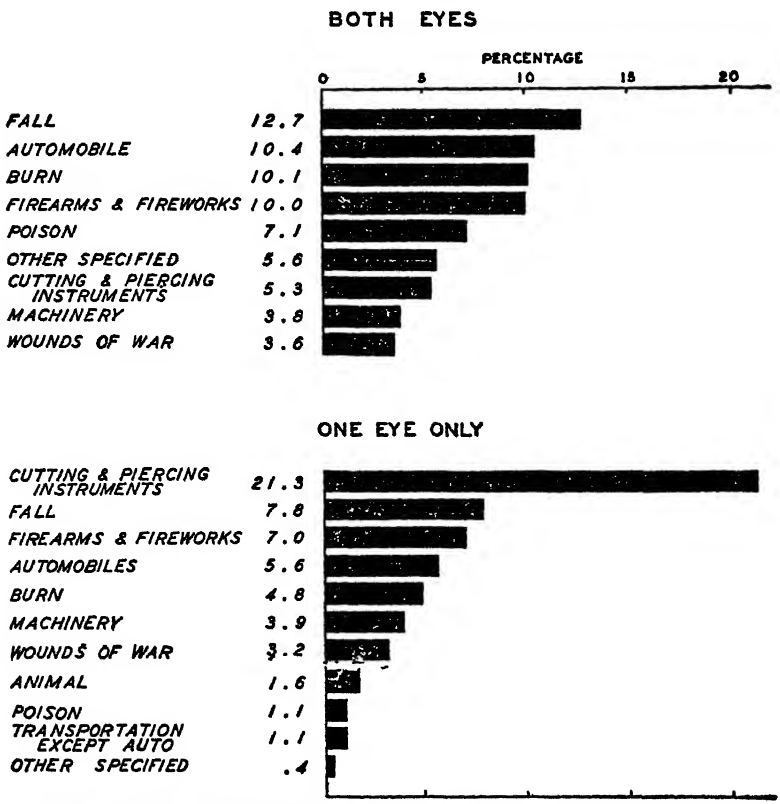


FIGURE 5.—Percentage distribution of cases of blindness due to accident, by means of injury.

(both eyes and one eye only) by specific cause. Here 100 percent is taken as the total group of cases. As a cause of blindness in both eyes, cataract ranks first, whereas for blindness in one eye only, occupational accidents rank first; second position is held by degenerative diseases and home accidents, respectively; third position by glaucoma and cataract, respectively.

Where the cause of blindness was an accident, the enumerator not only recorded the place of occurrence of the accident but also the means of injury. In view of the long interval, on the average, between

the time of the accident resulting in blindness and that of the Health Survey, it would be expected that the information obtained in this manner would be somewhat incomplete. As a matter of fact, no report as to means of injury was given for 31 percent of the accident cases resulting in blindness in both eyes; for blindness in one eye only this percentage was 42. In spite of this fact, the data seem worth reproducing (fig. 5). No attempt was made to allocate the percentages for the cases with unspecified means of injury.

For blindness in both eyes, falls, motor vehicles, burns, and firearms and fireworks were the principal means of injury; for blindness in one eye only cutting and piercing instruments were by far the most important means.

CAUSE AND SEX

Consideration of figure 6 will reveal that the higher rate of blindness in males is due to the greater frequency of accidents among them.

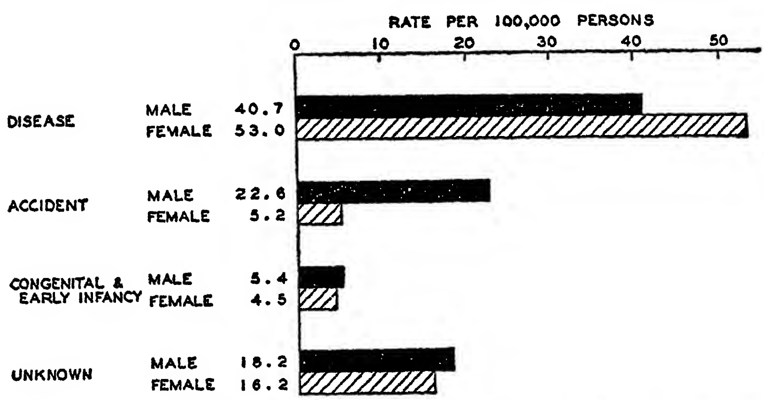


FIGURE 6—Prevalence of blindness (both eyes) according to sex and broad cause group (cases caused by nonaccidental injuries excluded).

The chart is limited to blindness in both eyes, but a similar relation is shown for blindness in one eye only. This fact is brought out in table 8, which presents the rates for specific causes as well as for the broad groups and the place of occurrence for accident causes. The ratio of the rate for one sex to that for the other is also given. The contrast offered between disease and accident causes is striking.

It may be noted that for blindness in both eyes due to accident the ratio of the rate for males to that for females was 4.4, and that for blindness in one eye only the ratio was 5.5.

CAUSE AND AGE

In studying the relation between causes of blindness and age, it is most fruitful to deal with the data in terms of the age at which the cases occurred, i. e., in terms of the estimated annual incidence of new cases as calculated previously. Owing to relatively small

numbers, only broad comparisons are practicable. Tables 9 and 10 present the prevalence and the estimated annual incidence of blindness due to accident and the corresponding rates for blindness due to disease. In table 9 a separate column is provided for cases with unknown cause. The similarity in form between the cases due to disease and those with unknown cause suggests that the latter are largely due to disease.

TABLE 8.—*Prevalence of blindness, by sex, specific cause, and place of accident (for accident causes)*

Cause	Both eyes				1 or both eyes			
	Rate per 100,000		Ratio		Rate per 100,000		Ratio	
	Male	Female	Male to female (female=100)	Female to male (male=100)	Male	Female	Male to female (female=100)	Female to male (male=100)
All causes	87.0	78.8	110		531.1	295.0	180	
Diseases	40.7	53.0		130	163.2	179.7		110
Cataract	13.3	18.1		136	65.4	68.4		105
Glaucoma, etc	7.7	9.2		119	22.0	24.8		113
Ocular infection	1.3	1.5		115	8.0	7.7	104	
Tumors (malignant or benign)	.50	.77		154	4.7	4.4	107	
Localized infections (except ocular)	1.0	1.1		110	7.7	10.3		134
General infectious diseases	4.9	5.1		104	17.9	18.8		105
Degenerative diseases	7.3	14.3		196	23.1	36.2		157
Occupational hazards	1.4	.46	304		5.2	.77	675	
Ill-defined diseases	3.2	2.5	128		9.3	8.2	113	
Accidents	22.6	5.2	435		294.0	54.6	538	
Home	4.2	2.4	175		83.1	34.5	241	
Occupational	10.5	.23	4,565		128.9	1.9	6,784	
Public.								
Automobile	2.2	.69	319		14.9	5.9	253	
Other	3.3	1.1	300		45.5	7.9	576	
Unspecified place	2.3	.77	299		21.6	4.3	502	
Nonaccidental injuries	.17				4.6	1.3	354	
Congenital and early infancy	5.4	4.5	120		24.3	20.4	119	
Unknown cause	18.2	16.2	112		45.0	39.1	115	

The relatively greater importance of accidents in the younger ages and the relatively greater importance of diseases in the older ages may be more clearly seen from the percentage of cases, at any one age, which were recorded as due to accident. These percentages, based on the estimated annual incidence of new cases, were:

	Percentage [1]			Percentage [1]	
	Both eyes	1 or both eyes		Both eyes	1 or both eyes
Under 7½		45	50–59	13	24
7½–19		74	60–69	11	18
20–29	31	52	70–79	5.5	14
30–39	29	64	80–89		
40–49	21	39			

[1] Numerator from table 10, denominator from table 3.

TABLE 9.—*Prevalence of blindness, according to age, by broad cause groups*

Age (years)	Both eyes				1 eye only				1 or both eyes			
	Accident	Disease	Congenital and early infancy	Unknown	Accident	Disease	Congenital and early infancy	Unknown	Accident	Disease	Congenital and early infancy	Unknown
	Rate per 100,000											
All ages	14	47	4.9	17	156	125	17	25	170	172	22	42
Under 15	.83	3.8	4.5	2.7	37	19	12	5.1	38	23	17	7.8
15–24	3.4	5.4	3.4	2.5	80	31	15	7.2	83	36	19	9.6
25–34	7.1	8.9	4.7	6.1	103	41	16	14	110	50	21	20
35–44	13	18	5.3	13	194	65	21	25	207	83	26	37
45–54	22	39	6.3	23	256	130	18	41	278	169	24	64
55–64	35	100	6.6	45	327	304	22	56	362	404	29	102
65–74	66	302	5.9	84	464	769	26	109	530	1,072	32	193
75–84	97	809	8.6	178	663	1,561	43	143	760	2,370	52	321
85 and over		2,396	--------	446		2,786	37	204		5,181	37	650
	Cases [1]											
All ages	338	1,177	123	428	3,900	3,114	434	619	4,238	4,291	557	1,047
Under 15	5	23	27	16	226	115	75	31	231	138	102	47
15–24	15	24	15	11	356	137	68	32	371	161	83	43
25–34	30	38	20	26	437	175	68	61	467	213	88	87
35–44	52	71	21	50	767	258	83	97	819	329	104	147
45–54	66	118	19	70	776	394	55	123	842	512	74	193
55–64	64	183	12	83	597	555	41	103	661	738	53	186
65–74	67	309	6	86	474	786	27	111	541	1,005	33	197
75–84	39	282	3	62	267	544	15	50	306	826	18	112
85 and over		129	--------	24		150	2	11		279	2	35

[1] 72 cases of blindness caused by nonaccidental injuries have been excluded: 2 cases, blind in both eyes, 70 cases blind in 1 eye only.

TABLE 10.—*Estimated annual incidence of new cases of blindness per 100,000 according to age, by broad cause groups* [1]

Age (years)	Both eyes		1 or both eyes	
	Accident [2]	Disease [3]	Accident [2]	Disease [3]
All ages	0.75	4.7	7.0	14.3
Under 7½	.11	1.1	5.2	5.3
7½–19	.20	.04	3.7	1.2
20–29	.37	.49	2.8	1.6
30–39	.63	.96	9.9	3.9
40–49	.87	2.2	7.1	8.4
50–59	1.3	6.1	8.8	23.9
60–69	3.1	20.2	16.3	67.1
70–79	3.5	50.9	23.8	131.7
80–89	------------	157.8	------------	279.7

[1] Rates for unknown causes are omitted.
[2] Includes nonaccidental injuries.
[3] Includes congenital and early infancy causes.

In the section on sex and age, it was pointed out that the females, at all ages combined, showed a lower prevalence of blindness than the males, but a higher annual incidence of new cases. This fact was obviously associated with the higher rate of blindness due to accidents among males. Hence, it could be expected that a corresponding difference between prevalence and incidence rates would be shown in

comparing disease and accident causes. Consideration of tables 9 and 10 will show this to be true. Whereas, in the prevalence rates, 16 percent of the cases of blindness in both eyes were due to accident, the incidence rates showed 11 percent due to accident. In the case of blindness in one or both eyes, the corresponding percentages were 42 and 30.

For blindness in one or both eyes, there was a sufficient number of cases to permit a subdivision of the incidence estimates for blindness due to accident by place of occurrence of the accident. The estimated annual rate of new cases was as follows:

	Incidence per 100,000
All	7.0
Home	2.0
Public:	
Motor vehicle	.38
Other	.86
Occupational	3.1

Although these small numbers prevent exact comparisons by age, it may be said that the incidence rates for home and public accidents resulting in blindness were relatively high in childhood and in old age; occupational accidents naturally showed an inverse tendency. The prevalence rates are given in table 11 by broad age groups.

TABLE 11.—*Prevalence of blindness (1 or both eyes) due to accident, according to place of the accident*

Age (years)	Rate per 100,000					Cases				
	Home	Public		Occupational	Unspecified	Home	Public		Occupational	Unspecified
		Auto	Other				Auto	Other		
All ages	58	10	26	63	13	1,446	255	649	1,573	315
Under 15	23	3.8	9.1		1.7	141	23	55	2	10
15–34	44	6.3	23	19	4.2	384	55	200	162	37
35–54	71	13	31	95	26	499	91	220	607	184
55–74	111	25	45	218	23	316	70	129	622	65
75 and over	203	40	112	298	47	106	16	45	120	19

COLOR

Blindness was much more prevalent in the colored [13] than in the white populations of urban areas. For blindness in both eyes the rate was 146 per 100,000 among the colored as against 76 among the white; for blindness in one eye only the corresponding rates were 327 and 325. It is likely that blindness in one eye was not as completely recorded for the colored population as for the white and therefore, in the further discussion, attention will be confined to blindness in both eyes. In table 12 are given the rates in the white and in the colored

[13] Colored, as used here, refers largely to Negro, but the term is used because of the inclusion of small populations of other colored races.

population by geographic area[14] and sex, with the ratio of the colored rate to the white. The rates have been adjusted to the age composition of the total surveyed urban population to eliminate the effect of differences due to dissimilar age compositions in the various regions.

The excess in the rates for the colored population is maintained in each area, but is greatest in the South. The excess of the rate for colored over that for white persons is consistently greater among males than among females. (See also fig. 7.)

TABLE 12.—*Prevalence [1] of blindness (both eyes) according to color, geographic area, and sex*

Area and color	Rate per 100,000			Cases		
	Both sexes	Male	Female	Both sexes	Male	Female
South:						
White	74	75	72	211	99	112
Colored	217	257	183	206	107	99
Northeast:						
White	70	74	65	614	297	317
Colored	152	176	131	54	30	24
North Central:						
White	81	88	73	636	326	310
Colored	207	245	167	90	51	9
	Ratio of colored rate to white (white=100)					
South	293	343	254			
Northeast	217	238	202			
North Central	256	278	229			

[1] Rates adjusted to the age composition of the total urban surveyed population.

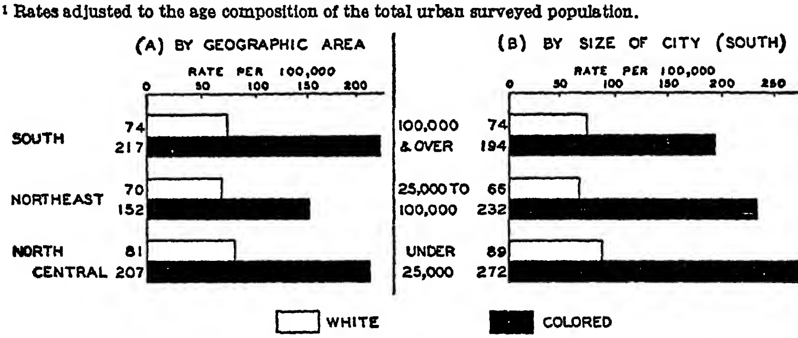


FIGURE 7.—Prevalence of blindness (both eyes) according to (*A*) color and geographic area and (*B*) color and size of city in the South. (Rates adjusted to the age composition of the total urban surveyed population.)

In table 13 a similar comparison is made by size of city (for the South only, where the numbers in the colored population justify the comparison). The excess in the rates for colored over those for white persons is greatest in cities below 100,000. (See also fig. 7.)[15]

[14] For the States comprising the geographic areas under consideration see footnote 16. The West is omitted from the comparison by color, since the canvassed colored population in that area was of a different make-up from that in the rest of the country.

[15] It may be noted that the rates of blindness (both eyes) in the rural survey of 16 counties of Georgia were for white and colored, 85 and 121, respectively.

The relative excess in the rate for colored over that for white persons is not constant at different ages but shows a tendency to rise rapidly with advancing age. (See table 14.)

TABLE 13.—*Prevalence [1] of blindness (both eyes) according to color, size of city, and sex, South only*

Size of city and color	Rate per 100,000			Cases	
	Both sexes	Male	Female	Male	Female
All sizes:					
White	74	75	72	99	112
Colored	217	257	183	107	99
100,000 and over:					
White	74	78	68	58	61
Colored	194	225	168	53	51
25,000–100,000:					
White	66	66	67	24	28
Colored	232	309	172	31	25
Under 25,000:					
White	80	81	94	17	23
Colored	272	303	245	23	23
	Ratio of colored rate to white (white=100)				
100,000 and over	262	288	247		
25,000–100,000	352	468	257		
Under 25,000	306	371	261		

[1] Rates adjusted to the age composition of the total urban surveyed population.

TABLE 14.—*Prevalence of blindness (both eyes) according to color and age*

Age (years)	Rate per 100,000		Ratio of colored rate to white (white=100)	Cases	
	White	Colored		White	Colored
All ages	76	116	192	1,700	368
Under 15	11	11	127	61	10
15–24	14	23	161	55	10
25–44	33	77	233	238	71
45–64	107	353	330	480	136
65 and over	617	1,648	255	866	141

GEOGRAPHIC AREA

No wide differences in the prevalence rates of blindness (both eyes) were observed in the four geographic areas. (See table 15 in which the rates are again adjusted to the age composition of the total urban surveyed population.)

There was, however, some trend with size of city. For all geographic areas combined, the rates increased from 74 for cities of 500,000 and over, to nearly 100 in cities below 100,000. This trend was observable in all geographic areas except the West.

[16] The Northeast area comprised surveyed cities in Massachusetts, New Jersey, New York, and Pennsylvania; the North Central, those in Illinois, Michigan, Minnesota, Missouri, and Ohio; the South, those in Alabama, Georgia, Louisiana, Texas, and Virginia; the West, those in California, Oregon, Utah, and Washington. See Perrott, Tibbitts, and Britten, op. cit., for list of cities surveyed.

TABLE 15.—*Prevalence*[1] *of blindness (both eyes) according to geographic area and size of city*

Size of city	All areas	North-east	North Central	South (white)[2]	West
	Rate per 100,000				
All sizes	83	73	88	74	69
500,000 and over	74	69	81	----------	70
100,000-500,000	84	78	74	74	78
25,000-100,000	100	87	119	66	67
Under 25,000	89	74	96	89	58
	Cases				
All sizes	2,068	668	726	211	257
500,000 and over	750	385	300	----------	65
100,000-500,000	647	134	164	119	126
25,000-100,000	365	67	171	52	19
Under 25,000	306	82	91	40	47

[1] Rates adjusted to age composition of total urban surveyed population.
[2] See table 13 for data for colored population.

ECONOMIC STATUS

Although the economic status of the blind is a changing phenomenon owing to the rapid expansion of the social security program, it is of interest to indicate what the position of the blind was in 1935, prior to such expansion. It is to be recalled that the rates here considered are largely exclusive of persons in schools or institutions for the blind.

In the Health Survey, families were classified by income received during the 12 months preceding the interview and also by whether relief had been received during that time. Persons in families[17] with annual incomes under $1,000 comprised about 40 percent of the surveyed group; about 65 percent were in families with annual incomes under $1,500; and 80 percent were in families with incomes under $2,000.

Families were identified as having received relief if at any time during the 12 months immediately preceding the visit of the enumerator one or more members had received aid such as work relief and other public assistance,[18] mothers' pension, pension for the blind, or a grant for any similar purpose from public funds administered by the Federal, State, or local government. About 18 percent of the surveyed population fell in this relief group.

Two-thirds of the blind (both eyes) were in families with annual incomes under $1,000. (See table 16.) More than three-fifths of persons blind in one eye only were in the same income group.

[17] For the purpose of this report, all persons living in a household were classified according to the total income of the related members of that household. See Perrott, Tibbitts, and Britten, op. cit., for precise definition of what was meant by income.

[18] Includes work relief against a relief budget and employment on work relief projects at security wages for persons taken from relief rolls.

Table 17 and figure 8 show that the income group below $1,000 had rates of blindness (both eyes) about four times as great as that of the group with incomes of $5,000 or more. There were also markedly higher rates for the low income groups in the case of blindness in one eye only. The differences were greater for males than for females. (See table 18.)

TABLE 16.—*Percentage of the blind who were in specified economic status groups*

Annual family income and relief status	Percentage[1]			Cases		
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes
All incomes				2,068	8,137	10,205
All known incomes	100	100	100	1,989	7,877	9,866
Relief	31	31	31	621	2,407	3,028
Nonrelief:						
Under $1,000	37	32	33	738	2,494	3,232
$1,000 to $1,500	14	17	16	287	1,324	1,611
$1,500 to $2,000	9.3	11	11	185	859	1,044
$2,000 to $3,000	5.3	6.8	6.5	106	538	644
$3,000 to $5,000	1.6	2.3	2.1	31	181	212
$5,000 and over	1.1	.94	.96	21	74	95
Unknown				79	260	339

[1] Percentages based on known income.

TABLE 17.—*Prevalence [1] of blindness according to economic status, and ratio to rate in families with income of $5,000 and over*

Annual family income and relief status	Rate per 100,000			Ratio to rate in $5,000 income group		
	Both eyes	1 eye only	1 or both eyes	Both eyes	1 eye only	1 or both eyes
All incomes [2]	83	326	400			
Relief	163	618	781	494	511	507
Nonrelief:						
Under $1,000	110	390	500	333	322	325
$1,000 to $1,500	59	260	319	179	215	207
$1,500 to $2,000	53	228	281	161	188	182
$2,000 to $3,000	41	195	236	124	161	153
$3,000 to $5,000	27	150	177	82	124	115
$5,000 and over	33	121	154	100	100	100

[1] Adjusted to the age composition of the total urban surveyed population.
[2] Includes unknown income.

Although in every age group there were higher rates of blindness in the low income groups, the excess reached a maximum in middle adult life (45–64), where the ratio to the income group of $2,000 and more reached a peak of 966 to 100. The rates are shown by age in tables 19 and 20.

EMPLOYMENT STATUS

The employment status of the surveyed population was determined as of the day of the visit. The categories to be used in the present comparisons are:

TABLE 18.—*Prevalence*[1] *of blindness according to sex and economic status and ratio to rate in families with income of $3,000 and over*

Annual family income and relief status	Both eyes		1 eye only		1 or both eyes	
	Male	Female	Male	Female	Male	Female
	Rate per 100,000					
All incomes [2]	89	76	451	212	540	288
Relief	179	147	837	410	1,016	557
Nonrelief:						
Under $1,000	128	96	558	247	686	343
$1,000 to $1,500	62	55	360	168	422	223
$1,500 to $2,000	50	54	320	140	370	194
$2,000 to $3,000	35	45	253	138	288	183
$3,000 and over	26	32	196	92	222	124
	Ratio to rate in families with income of $3,000 and over					
All incomes [2]	----------	----------	----------	----------	----------	----------
Relief	688	459	427	446	458	449
Nonrelief:						
Under $1,000	492	300	285	268	309	277
$1,000 to $1,500	238	172	184	183	190	180
$1,500 to $2,000	192	169	163	152	167	156
$2,000 to $3,000	135	141	129	150	130	148
$3,000 and over	100	100	100	100	100	100
	Cases					
All incomes [2]	1,045	1,023	5,332	2,805	6,377	3,828
Relief	337	284	1,591	816	1,928	1,100
Nonrelief:						
Under $1,000	378	360	1,605	889	1,983	1,249
$1,000 to $1,500	144	143	880	444	1,024	587
$1,500 to $2,000	86	99	590	269	676	368
$2,000 to $3,000	45	61	344	194	389	255
$3,000 and over	22	30	168	87	190	117

[1] Adjusted to the age composition of the total urban surveyed population.
[2] Includes unknown income.

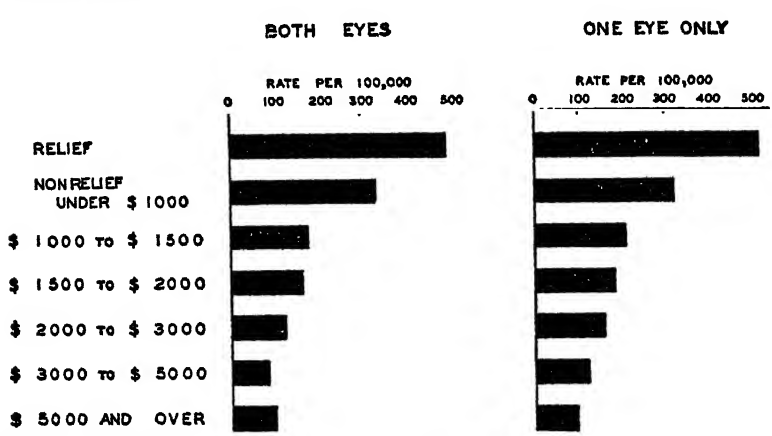


FIGURE 8.—Ratio of rates of blindness in specific economic status groups to rate in group with annual family income of $5,000 and over. (Rates adjusted to age composition of total urban surveyed population.)

(*a*) *Employed workers.*—Persons employed in private industry or in regular government work whether or not at the usual occupation and whether the wages were paid in money or in kind.[19]

(*b*) *"Unemployable" males.*—An item on the schedule gave some information as to physical status. The question was whether the person, if not employed and not seeking work, was prevented from so doing by physical or mental disability.[20] The group was made up

TABLE 19.—*Prevalence of blindness (both eyes) according to age and economic status, and ratio to rate in families with incomes of $2,000 and over*

Annual family income and relief status	Under 25 years	25–44	45–64	65 and over
	Rate per 100,000			
All incomes [1]	13	38	127	707
Relief	15	75	309	1,241
Nonrelief:				
Under $1,000	19	66	188	775
$1 000 to $1,500	11	22	79	558
$1,500 to $2,000	11	15	64	533
$2,000 and over	6.3	13	32	411
	Ratio to rate in families with incomes of $2,000 and over			
All incomes [1]	----------	----------	----------	----------
Relief	238	577	966	302
Nonrelief:				
Under $1,000	302	508	588	189
$1,000 to $1,500	175	169	247	136
$1,500 to $2,000	175	115	200	130
$2,000 and over	100	100	100	100
	Number of cases			
All incomes [1]	136	309	616	1,007
Relief	37	89	221	274
Nonrelief:				
Under $1,000	45	122	216	355
$1,000 to $1,500	24	41	77	145
$1,500 to $2,000	17	22	50	96
$2,000 and over	10	20	32	96

[1] Includes unknown income.

largely of individuals with severe chronic disease or incapacitating impairments (of which blindness is an excellent example); hence the term "unemployable" may be applied, with some reservations, to the group. All blind males (both eyes) who were not employed or not on work relief jobs have been assumed to be "unemployable" for the purpose of these comparisons.

[19] This group included persons who were absent from work on the day of the visit because of illness, temporary disability, vacation, strike, etc., but who had jobs to which they expected to return; persons not actually working on the day of the visit because their work was part time or irregular; all workers employed on P. W. A. projects; and those workers on W. P. A. projects who were in administrative or supervisory positions or who were paid at "security" wages but who were not taken from relief rolls. Persons on relief jobs, paid at "security" wages and taken from relief rolls, were not classified as "employed."

[20] Enumerators were instructed not to include as "unemployables," "persons who have an acute illness at present * * * and will return to work or will seek work on recovery."

TABLE 20.—*Prevalence of blindness (one eye only) according to age and economic status, and ratio to rate in families with incomes of $2,000 and over*

Annual family income and relief status	Under 15 years	15–24	25–44	45–64	65 and over
	Rate per 100,000				
All incomes [1]	75	134	240	550	1,717
Relief	97	232	487	1,130	3,043
Nonrelief:					
Under $1,000	85	141	305	706	1,895
$1,000 to $1,500	66	109	189	436	1,354
$1,500 to $2,000	66	129	164	343	1,183
$2,000 and over	34	58	126	276	1,054
	Ratio to rate in families with incomes of $2,000 and over				
All incomes [1]					
Relief	285	400	387	409	289
Nonrelief:					
Under $1,000	250	243	242	256	180
$1,000 to $1,500	194	188	150	158	128
$1,500 to $2,000	194	222	130	124	112
$2,000 and over	100	100	100	100	100
	Number of cases				
All incomes [1]	450	599	1,971	2,672	2,445
Relief	152	193	582	808	672
Nonrelief:					
Under $1,000	111	144	560	811	868
$1,000 to $1,500	86	102	357	427	352
$1,500 to $2,000	58	88	233	267	213
$2,000 and over	28	45	196	278	246

[1] Includes unknown income.

TABLE 21.—*Percentage of all the blind (both eyes) who were classified as employed, according to age and sex*

Sex	All ages	Under 15 years	15–24	25–34	35–44	45–54	55–64	65 and over
				Percentage				
Both sexes	10		15	30	25	20	12	2.9
Male	19		21	48	35	30	20	6.3
Female	2.2		4.3		9.2	6.1	1.9	.34
				Employed blind				
Both sexes	217		10	34	49	54	41	29
Male	195		9	32	42	47	38	27
Female	22		1	2	7	7	3	2
				Total blind				
Both sexes	2,068	71	65	114	195	274	342	1,007
Male	1,045	42	43	67	119	159	187	428
Female	1,023	29	22	47	76	115	155	579

Ten percent of the blind (both eyes) were recorded as being employed. (See table 21.) It is to be realized that such employment as they had was of a different character than that in the case of persons

who were not physically handicapped. Some of the blind were employed in industrial establishments provided for them; some worked in private industry; but it is doubtful whether many had earning power sufficient to make them economically independent. As an indication of the type of employment which they followed, the employed blind (both eyes), aged 15–64, are classified in table 22 by their usual occupation. In some cases the occupation is that followed prior to the development of blindness.

TABLE 22.—*Percentage distribution of employed blind persons (both eyes), 15–64 years of age, by specific occupation (usual)*

Occupation	Number	Per cent
Professional persons	81	16.5
Musicians and teachers of music	14	
Others	17	
Retail dealers	32	17.0
Candy, books, stationery, tobacco, etc.	14	
Hucksters, peddlers	12	
Others	6	
Proprietors, managers, and officials, except retail dealers	9	4.8
Clerks and kindred workers	38	20.2
Salesmen, real estate and insurance agents	7	
Canvassers	4	
Commercial travelers	11	
Clerks and kindred workers—Con.		
Newsboys	5	
Clerks, except in stores	8	
Others	3	
Skilled workers and foremen	14	7.5
Piano tuners	6	
Others	8	
Semiskilled workers	51	27.1
In manufacturing industries:		
Broom and brush	22	
Furniture and woodworking	13	
Other	13	
Other semiskilled workers	3	
Unskilled workers [1]	13	6.9
Total	188	100.0

[1] Includes 7 persons of unknown occupation.

TABLE 23.—*Prevalence of blindness (both eyes) among employed males and females and among "unemployable" males, according to age*

Employment status and sex	All ages, 15–64	15–24	25–34	35–44	45–54	55–64
	Rate per 100,000					
Employed:						
Both sexes	24	6.7	15	24	37	58
Male	29	11	20	27	40	65
Female	8.9	1.4	2.8	16	27	25
"Unemployable:"[1] Male	188	28	141	355	481	633
	Cases					
Employed:						
Both sexes	188	10	34	49	54	41
Male	168	9	32	42	47	38
Female	20	1	2	7	7	3
"Unemployable":[1] Male	401	34	35	76	109	147
	Population					
Employed:						
Both sexes	796,689	148,652	231,399	201,835	144,255	70,548
Male	573,059	78,882	160,513	156,956	117,927	58,781
Female	223,630	69,770	70,886	44,879	26,328	11,767
"Unemployable":[1] Male	213,339	121,213	24,808	21,424	22,660	23,234

[1] All males blind in both eyes who were not employed or on work relief have been classified as "unemployable."

Another point of view is emphasized in table 23 which gives, according to age, the prevalence of blindness (both eyes) among employed persons, by sex, and among "unemployable" males. Nearly 2 percent of the "unemployable" males, aged 15–64, were blind in both eyes.

SUMMARY

This report presents the data on blindness obtained among the urban population of the National Health Survey, a house-to-house canvass of more than 700,000 urban families (2,498,180 white and colored persons of known age) in 18 States, made from November 1935 to March 1936. The data were obtained in a group of 83 cities selected to be representative by geographic area and size of city of urban United States.

1. The number of persons per 100,000 recorded as being blind in both eyes was 83, the number blind in one eye only 326, and the number blind in one or both eyes 409.

2. The prevalence of blindness was greater among males than among females.

3. More than one-fourth of all the blind (both eyes) were over 75 years of age and two-thirds were over 55 years of age.

4. The rates varied markedly with age. Among children (under 15 years of age) the rate of blindness was 12 per 100,000 for both eyes and 86 for one or both eyes. With each succeeding age group there was a marked increase in the rate, which reached the extreme figure of 2,916 (both eyes) and 6,630 (one or both eyes) for persons 85 or more years of age.

5. The estimated annual incidence of new cases of blindness was 6.6 per 100,000 population.

6. Males showed a higher prevalence of blindness (both eyes) up to 75 years of age; above that age the prevalence was greater among females. Blindness in one eye only showed much greater difference by sex; the rate for males was greater than that for females in each age group without exception.

7. The estimated annual incidence of new cases of blindness (both eyes) was higher among females than among males. The reverse was true for blindness in one or both eyes.

8. Diseases were the major cause of blindness in both eyes, accidents having been recorded as the cause in only one-sixth of the cases; for blindness in one eye only accidents played a much more important role, being recorded as the cause in about one-half of these cases.

9. Cataract, glaucoma, or other diseases of the eye were recorded as the cause in more than half of the cases of blindness due to disease. Of those diseases which did not originate in the eye, degenerative disease was the major cause.

10. More than a third of the cases of blindness due to accident (either both eyes or one eye only) were recorded as having resulted from occupational accidents.

11. A fourth of all cases of blindness in both eyes and a third of all cases in one eye only which were the result of accidents were due to home accidents.

12. For blindness in both eyes, falls, motor vehicles, burns, firearms, and fireworks were the principal means of injury; for blindness in one eye only, cutting and piercing instruments were by far the most important means.

13. The prevalence of blindness due to accident was about five times as great among males as among females (the ratio being 4.4 for blindness in both eyes and 5.5 for blindness in one eye only).

14. Estimates of the annual incidence of new cases of blindness by age and cause demonstrated the relatively greater importance of accidents as a cause of blindness in the younger ages and the relatively greater importance of disease as a cause in the older ages.

15. Sixteen percent of the cases of blindness in both eyes were due to accident; for blindness in one or both eyes the percentage was 42.

16. The incidence of blindness resulting from home and public accidents was relatively high in childhood and old age; for blindness due to occupational accidents there was an inverse tendency.

17. Blindness was much more prevalent in the colored than in the white populations, the rates being, respectively, 146 and 76 per 100,000 for blindness in both eyes. This contrast was noted in each geographic area and in each city-size group in the South.

18. No wide differences in the prevalence of blindness (both eyes) were observed in the four geographic areas.

19. The prevalence of blindness was greater in cities under 100,000 population than in large cities.

20. Two-thirds of the blind (both eyes) were in families with annual incomes under $1,000.

21. The rate in the group with incomes under $1,000 was about four times as great as that in families with incomes of $5,000 or more.

22. The excess rate of blindness in the low income groups reached a maximum in middle adult life (age group 45–64).

23. Ten percent of the blind (both eyes) were recorded as being employed.

24. The prevalence of blindness (both eyes) was relatively low among the employed workers, a large proportion of the blind being in the "unemployable" group. Nearly 2 percent of the "unemployable" males, aged 15–64, were blind in both eyes.

TREATMENT OF DIETARY LIVER CIRRHOSIS IN RATS WITH CHOLINE AND CASEIN [1]

By J. V. LOWRY, *Passed Assistant Surgeon*, FLOYD S. DAFT, *Senior Biochemist*, W. H. SEBRELL, *Surgeon*, L. L. ASHBURN, *Passed Assistant Surgeon*, and R. D. LILLIE, *Senior Surgeon, United States Public Health Service*

Cirrhosis of the liver has been produced in rats under various dietary conditions by a number of workers (*1–6*). Three groups of these workers (*3*, *5*, *6*) have reported the prevention of cirrhosis by specific substances. György, Poling, and Goldblatt (*5*) stated that dietary liver injury (cirrhosis, necrosis, or a combination of both) was prevented to a large extent by casein or by a combination of cystine and choline. An earlier paper by György and Goldblatt (*2*) reported that 10 to 20 mg. of choline daily reduced the incidence and severity of the liver injury but not to a great extent. Blumberg and McCollum (*3*) reported the development of cirrhosis (with or without necrosis) on a high fat diet and its prevention by the addition of 10 mg. of choline per gram of diet. The cirrhotic process was slowed but not prevented by 25 mg. of methionine per rat per day. Daft, Sebrell, and Lillie (*6*) reported the consistent production of a dietary liver cirrhosis in rats and its apparent prevention by means of choline, methionine, or casein. Their diet No. 545 had the following composition: Leached casein 4 percent, cystine 0.5 percent, cod-liver oil 2 percent, Wesson oil 3 percent, Osborne and Mendel salt mixture 4 percent, and corn starch 86.5 percent. A supplement of 100 micrograms of thiamin chloride, 50 micrograms of riboflavin, 20 micrograms of pyridoxine, 50 micrograms of calcium pantothenate, and 1 mg. of nicotinic acid was given to each rat daily. Some of their animals received 20 percent alcohol instead of water as a source of fluid. Cirrhosis occurred in both groups.

The results of the treatment of rats with liver cirrhosis produced by the above regime of Daft, Sebrell, and Lillie are reported here.

EXPERIMENTAL

Albino rats at weaning were started on diet No. 545 with the vitamin supplements given above. In about half of the animals 20 percent alcohol replaced water as a source of fluid. After 7 to 12 weeks on this regime the rats were anesthetized with ether, and a small portion of liver was removed. After this biopsy, 21 of the animals were treated as follows: Nine rats continued on the cirrhosis-producing regime with the addition of 40 mg. of choline to each daily supplement; seven rats continued to receive the same daily vitamin supplement but the diet was replaced by diet No. 582 [2] containing 50 percent of casein;

[1] From the Divisions of Chemotherapy and Pathology, National Institute of Health.

[2] Diet No 582 had the following composition: Leached casein 50 percent, cod-liver oil 2 percent, Wesson oil 3 percent, salt mixture 4 percent, cerelose 41 percent.

five rats were given the 50 percent casein diet No. 582 with the addition of 40 mg. of choline to the daily vitamin supplements. All of the animals had water as a source of fluid after the initial diagnostic biopsy. Second biopsy specimens were obtained from the livers of six of the rats after periods of treatment varying from 14 to 33 days. Two of these animals were then sacrificed after a total treatment period of 35 and 42 days in order to obtain the entire liver. The liver was obtained at autopsy in the other 15 rats after periods of treatment varying from 1 to 17 days.

The gross appearance of the livers at the initial diagnostic biopsy before treatment was started was quite uniform. A constant finding was a marked enlargement to approximately two or three times the usual size for a normal rat of similar weight. The color was changed from the normal reddish-brown to amber, frequently with bronze patches. The surface of the liver was rough, and the tissue was firm and abnormally resistant to cutting. The bronze-colored areas had a wrinkled appearance and were found most commonly on the superior surface approximating the diaphragm, on the under surfaces of the liver lobes, and on the lobes overlying the stomach. Two of the animals had ascites. On microscopic examination the biopsy specimens of the livers of 18 of the 21 rats showed cirrhosis. The biopsy specimens of the livers of the remaining 3 rats showed marked fatty changes and subsequent examination of the entire liver showed cirrhosis in other areas.

The typical hepatic cirrhosis showed coarse and fine trabeculation which divided the parenchyma into large and small, often irregularly shaped nodules. The trabeculae were formed of collagen fibers enmeshing numerous phagocytes filled with homogeneous globules which stain brownish orange with Sudan IV and blue, bluish green, or greenish yellow with Giemsa. Frequently one or more medium sized areas were present in which there was subtotal obliteration of parenchyma. In such areas single or small groups of liver cells were often isolated. Fat globules in the liver cells were a prominent part of the process. Fat was present as large globules near the trabeculae and as fine droplets in other parts of the lobule. The amount varied but was commonly very marked. This process was the same as that previously described by Lillie, Daft, and Sebrell (4).

RESULTS OF TREATMENT

Regenerative changes in the liver occurred in animals on all three of the treatment regimes. There was, however, a marked difference in the rate of growth. The animals that were changed from diet No. 545 to the high casein diet No. 582 showed a marked increase in the rate of gain in weight as compared to the rate of gain prior to treatment. The rate of gain of those that continued on the cirrhosis-producing diet with the addition of choline was not greatly increased.

Ten animals were treated for 6 days or less. There was no discernible change in the gross appearance of the livers, but microscopic

examination showed the following changes: In 3 days there was very slight but appreciable decrease in the amount of fat in the liver cells. By the sixth day this change was fairly prominent and there was evidence of liver cell hyperplasia. Eleven animals were treated for 14 to 42 days. In this group there was a striking decrease in the size of the livers as well as a marked change in consistency and color. The areas that were bronze at the time of the diagnostic biopsy remained, but elsewhere the color had changed to a dark gray-red or the dark reddish brown characteristic of the normal rat liver. Histologically the picture was quite different after treatment as compared with the initial biopsy specimen. In most animals fat had completely disappeared from the liver cells; in an occasional liver it was present in very small amounts. Liver cells were very large, had wide zones of amphophilic granular cytoplasm and large and more deeply stained vesicular nuclei. Cells with two to six nuclei were not infrequently seen. In these multinucleate cells one nucleus was occasionally much larger and more deeply stained than the others. Round nodules of hyperplastic liver cells were present in the large areas of fibrosis. Another indication of hyperplasia was the absence of angular liver cell nodules. The margins of the nodules were convex and sharply outlined against the trabeculae which not infrequently appeared compressed. These changes were distinct in all of the animals in the group. None of the animals showed any decrease in number or change in distribution of the fat-containing phagocytes and there was no recognizable effect on the fibrous tissue.

DISCUSSION

The above findings demonstrate that extensive regeneration of liver cells occurs in this type of cirrhotic liver in rats when they are treated with choline, a high casein diet, or both. (The presence in casein of methionine, a precursor of choline, must, of course, be kept in mind.) There was obvious improvement in the gross appearance of the liver, and microscopic examination showed that there was almost total disappearance of manifest liver cell fat and definite hyperplastic regeneration of liver parenchyma. The trabeculation was still present after 42 days of treatment.

Because of the great improvement in the livers during this brief period of treatment it seemed desirable to report these findings. It is recognized that longer treatment of this liver cirrhosis may have an important bearing on the evaluation of dietary therapy.

The possible relation of choline deficiency to human liver cirrhosis is at present unknown. However in view of what is known of the physiological action of choline this possibility must be kept in mind. It is of interest to note that Patek (*7*) and Patek and Post (*8*) have reported beneficial results in the treatment of human liver cirrhosis

with a high vitamin diet and supplements rich in the vitamin B complex.

It follows that the desirability of conducting a clinical trial of choline and casein therapy in human liver cirrhosis should be considered.

SUMMARY

Rats with liver cirrhosis produced on a low choline, low casein diet with added cystine showed marked improvement in the gross appearance of the liver and hyperplastic regeneration of liver cells following treatment with choline, a high casein diet, or choline with a high casein diet. There was no recognizable effect on the fibrous tissue.

REFERENCES

(*1*) Earle, D. P., and Victor, J.: Cirrhosis of the liver caused by excess dietary cystine. J. Exp. Med., 73:161 (1941).
(*2*) Gyorgy, P., and Goldblatt, H.: Experimental production of dietary liver injury (necrosis, cirrhosis) in rats. Proc. Soc. Exp. Biol. and Med., 46:492 (1941).
(*3*) Blumberg, H., and McCollum, E. V.: The prevention by choline of liver cirrhosis in rats on high fat, low protein diets. Science, 93:598 (1941).
(*4*) Lillie, R. D., Daft, F. S., and Sebrell, W. H., Jr.: Cirrhosis of the liver in rats on a deficient diet and the effect of alcohol. Pub. Health Rep., 56:1255 (1941).
(*5*) Gyorgy, P., Poling, E. C., and Goldblatt, H.: Necrosis, cirrhosis, and cancer of liver in rats fed a diet containing dimethylaminoazobenzene. Proc. Soc. Exp. Biol. and Med., 47:41 (1941).
(*6*) Daft, F. S., Sebrell, W. H., and Lillie, R. D.: The production and apparent prevention of a dietary liver cirrhosis in rats. Proc. Soc. Exp. Biol. and Med. (In press).
(*7*) Patek, A. J., Jr.: Treatment of alcoholic cirrhosis of the liver with high vitamin therapy. Proc. Soc. Exp. Biol. and Med., 37:329 (1937).
(*8*) Patek, A. J., Jr., and Post, J.: Treatment of cirrhosis of the liver by a nutritious diet and supplements rich in vitamin B complex. J. Clin. Invest., 20:481 (1941).

THE TOXICITY AND POTENTIAL DANGERS OF NITROUS FUMES [1]

A Review

This publication is a review of the literature, contained in 125 papers, on the toxicity and potential dangers of nitrous oxide, nitrogen oxide, and nitrogen dioxide, the latter being the most important of the three oxides of nitrogen. The discussion covers its determination in the air, the sources of exposure, the concentrations encountered under different conditions, the toxicity for animals with regard to acute and late effects, its effect on the blood pigment, the incidence of fatalities, the clinical picture, and pathologic changes observed with nitrogen dioxide poisoning in man. This résumé is followed by

[1] Public Health Bulletin No. 272, same title as above, by W. F. von Oettingen. U. S. Government Printing Office, 1941. Available from the Superintendent of Documents, Washington, D. C., at 10 cents per copy.

a discussion of measures for the prevention of poisoning from nitrous fumes and the treatment of such poisonings. In regard to treatment, the importance of absolute rest and the necessity for medical care, even in cases which do not appear to be seriously affected, is emphasized. For alleviation of the irritation of the upper respiratory tract the inhalation of a mist of a 5-percent solution of sodium bicarbonate is recommended, and the treatment of incipient pulmonary edema is outlined. The use of atropine and morphine is discouraged. Pain may be alleviated with codeine or barbiturates. In cases of imminent cardiac failure cardiac stimulants may become necessary. Attention is also directed to possible late complications.

DEATHS DURING WEEK ENDED NOVEMBER 1, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 1, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	7,987	7,966
Average for 3 prior years	7,882	
Total deaths, first 44 weeks of year	367,614	368,911
Deaths per 1,000 population, first 44 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	571	556
Average for 3 prior years	496	
Deaths under 1 year of age, first 44 weeks of year	23,237	22,070
Data from industrial insurance companies:		
Policies in force	64,581,852	64,821,760
Number of death claims	10,738	10,433
Death claims per 1,000 policies in force, annual rate	8.7	8.4
Death claims per 1,000 policies, first 44 weeks of year, annual rate	9.4	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 8, 1941

Summary

A sharper decline was recorded in the incidence of poliomyelitis than in the preceding week, with 191 cases reported for the current week as compared with 285 cases for last week. The largest decreases were reported in New York, from 67 to 39, New Jersey, from 20 to 8, Pennsylvania, from 14 to 6, Tennessee, from 23 to 14, and Alabama, from 22 to 6. Only 3 States reported 15 or more cases, namely, New York, 39, Ohio, 15 (9 last week), and Illinois, 15 (20 last week).

The number of reported cases of influenza increased from 1,553 to 2,308. This increase was almost entirely accounted for by the increase in the number of cases in Texas from 759 to 1,392. The number of cases reported in Virginia increased from 70 to 157, and in California from 48 to 108, while the incidence in South Carolina decreased from 293 to 221.

According to reports from the State health officer, an epidemic of pneumonitis has prevailed in Texas during the past summer, a majority of the cases being reported in the southern part of the State. During the period May to October a total of 2,626 cases of pneumonia has been reported in the State, as compared with 1,102 cases for the corresponding period last year.

Only 4 cases of smallpox were reported, 1 case each in Indiana, Michigan, Georgia, and Idaho. Of 76 cases of endemic typhus fever, 30 occurred in Georgia, 20 in Texas, and 7 in Alabama. During the week ended October 25, 2 cases were reported among troops at Ft. Riley, Kansas.

The death rate for the current week for 88 large cities is 11.4 per 1,000 population, as compared with 11.2 for the preceding week and a 3-year (1938–40) average of 10.7.

Telegraphic morbidity reports from State health officers for the week ended November 8, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940	
NEW ENG.												
Maine	0	1	2	------	3	------	54	106	21	0	0	0
New Hampshire	1	0	0	------	------	------	1	0	3	0	0	0
Vermont	0	0	0	------	------	------	0	3	3	0	0	0
Massachusetts	3	2	2	------	------	------	79	227	105	2	2	1
Rhode Island	3	0	0	------	------	------	6	0	1	0	0	0
Connecticut	0	0	3	1	3	3	51	4	7	0	0	0
MID. ATL.												
New York [1]	26	14	15	[2] 2	[2] 6	[2] 8	116	262	139	4	2	4
New Jersey	5	6	16	4	------	4	18	112	48	3	2	2
Pennsylvania	9	15	28	------	------	------	237	518	60	2	2	4
E. NO. CEN.												
Ohio	19	11	56	11	16	6	36	30	14	2	0	2
Indiana	20	18	18	13	2	10	5	7	7	0	1	1
Illinois	25	34	84	20	1	10	47	218	16	1	0	0
Michigan [3]	11	10	15	------	3	1	29	330	54	0	1	1
Wisconsin	5	1	3	16	21	30	95	285	59	0	1	0
W. NO. CEN.												
Minnesota	1	1	6	1	4	1	1	45	31	0	1	0
Iowa	6	1	11	------	1	1	20	31	6	0	1	0
Missouri	4	10	20	6	------	4	8	26	9	0	0	1
North Dakota	2	7	3	4	1	1	91	0	1	1	0	0
South Dakota	5	3	2	1	------	------	1	2	2	0	0	0
Nebraska	7	0	1	------	------	------	2	5	1	0	0	0
Kansas	2	2	10	9	4	4	53	8	5	1	0	0
SO. ATL.												
Delaware	0	0	0	------	------	------	1	1	1	0	0	0
Maryland [3]	22	16	14	1	3	5	28	3	7	2	0	0
Dist. of Col.	0	2	6	2	------	2	1	0	1	0	0	0
Virginia [1]	36	25	66	157	74	74	62	23	8	1	2	2
West Virginia	16	12	17	9	2	14	179	7	10	1	0	1
North Carolina [1]	94	58	89	1	4	4	53	6	74	1	2	1
South Carolina [1]	23	11	21	221	144	220	22	9	5	0	0	0
Georgia [1]	32	13	40	36	31	31	14	4	4	0	0	0
Florida [1]	5	4	6	7	1	1	5	1	4	0	0	0
E. SO. CEN.												
Kentucky	22	8	31	4	7	7	24	51	25	1	3	3
Tennessee	7	14	36	7	25	28	4	30	8	0	1	2
Alabama [1]	34	13	36	49	27	59	12	14	3	1	3	2
Mississippi [3]	16	17	17	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	15	15	24	42	17	17	9	5	3	0	0	0
Louisiana [1]	9	12	19	13	2	11	0	1	1	2	0	1
Oklahoma	14	19	12	35	33	33	31	1	1	0	0	0
Texas [1]	79	28	57	1,392	220	170	44	38	22	1	1	1
MOUNTAIN												
Montana	6	7	0	5	1	3	15	1	2	1	0	0
Idaho	0	1	1	------	------	3	3	1	17	0	0	0
Wyoming	1	0	0	7	------	------	2	3	3	0	0	0
Colorado	23	3	8	21	7	7	21	20	13	0	0	0
New Mexico	2	0	5	------	1	1	5	19	5	0	0	0
Arizona	5	5	2	76	84	46	51	23	5	0	0	0
Utah [3]	0	0	1	14	15	2	9	2	23	0	0	0
Nevada	0	1	------	------	------	------	0	0	------	0	0	------
PACIFIC												
Washington	0	1	4	3	2	1	1	4	21	0	0	0
Oregon	12	4	4	10	------	13	15	10	10	0	0	0
California	14	16	28	108	22	22	228	21	28	4	1	1
Total	641	441	926	2,308	787	867	1,792	2,517	1,746	33	26	41
45 weeks	13,303	13,073	22,738	579,637	176,684	159,002	843,229	242,029	275,341	1,768	1,478	2,553

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 8, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940		Nov. 8, 1941	Nov. 9, 1940	
NEW ENG.												
Maine	0	1	0	7	10	10	0	0	0	1	2	2
New Hampshire	0	1	0	9	15	2	0	0	0	0	0	0
Vermont	2	0	0	1	5	5	0	0	0	0	0	0
Massachusetts	4	1	1	190	95	95	0	0	0	1	0	1
Rhode Island	1	0	0	5	6	8	0	0	0	0	0	0
Connecticut	1	0	0	17	15	32	0	0	0	1	0	0
MID. ATL.												
New York [1]	39	7	6	151	173	222	0	0	0	7	9	9
New Jersey	8	5	3	65	80	54	0	0	0	0	0	3
Pennsylvania	6	6	6	133	120	213	0	0	0	9	8	14
E. NO. CEN.												
Ohio	15	23	5	219	134	251	0	0	0	9	4	6
Indiana	[illegible]	24	2	36	[illegible]	109	1	0	3	1	4	3
Illinois	15	22	4	[illegible]	213	248	0	3	3	0	6	7
Michigan [3]	6	30	4	94	140	242	1	0	1	2	1	2
Wisconsin	12	23	4	115	93	138	0	2	3	0	2	2
W. NO. CEN.												
Minnesota	10	12	4	49	66	85	0	0	2	0	0	0
Iowa	2	12	3	45	50	66	0	1	6	0	1	2
Missouri	0	18	2	39	67	67	0	1	1	4	7	5
North Dakota	1	0	0	4	7	24	0	0	0	0	0	1
South Dakota	1	3	3	12	28	28	0	0	0	0	3	2
Nebraska	0	6	1	11	10	10	0	1	1	0	0	0
Kansas	1	7	3	71	58	101	0	0	1	2	3	4
SO. ATL.												
Delaware	0	0	0	2	4	6	0	0	0	1	0	0
Maryland [3]	2	0	0	38	32	35	0	0	0	7	0	4
Dist. of Col.	2	0	0	13	6	6	0	0	0	0	0	0
Virginia [1]	8	13	1	70	36	53	0	0	0	12	12	10
West Virginia	1	13	4	62	31	84	0	0	0	1	3	7
North Carolina [1]	1	1	1	80	131	96	0	0	0	2	2	4
South Carolina [1]	1	0	0	16	21	20	0	0	0	3	0	2
Georgia [1]	2	1	2	31	32	32	1	0	0	3	7	7
Florida [1]	0	1	1	1	1	5	0	0	0	1	5	1
E. SO. CEN.												
Kentucky	5	7	1	53	72	74	0	0	0	7	9	8
Tennessee	14	1	0	26	92	76	0	0	0	1	7	7
Alabama [1]	6	1	1	22	24	29	0	0	0	0	4	4
Mississippi [3]	4	2	2	6	12	14	0	0	0	2	1	5
W. SO. CEN.												
Arkansas	0	1	1	6	9	11	0	1	1	8	5	7
Louisiana [1]	0	7	1	4	11	16	0	1	1	5	7	7
Oklahoma	3	1	1	17	14	15	0	1	1	1	8	8
Texas [1]	4	4	4	47	32	39	0	3	3	17	16	22
MOUNTAIN												
Montana	3	0	0	26	26	33	0	0	4	0	1	2
Idaho	2	4	0	8	19	19	1	0	0	1	2	2
Wyoming	0	2	0	17	7	6	0	0	1	1	0	0
Colorado	0	0	0	13	39	39	0	0	2	1	2	2
New Mexico	0	0	0	5	6	8	0	0	0	0	5	5
Arizona	0	0	0	1	10	6	0	0	0	0	1	1
Utah [3]	3	3	0	6	17	22	0	0	0	0	1	0
Nevada	0	0	------	3	0	------	0	0	------	0	0	------
PACIFIC												
Washington	1	11	2	52	16	28	0	1	1	0	3	4
Oregon	0	0	1	10	15	31	0	3	1	0	0	1
California	5	2	11	83	89	133	0	0	1	3	3	7
Total	191	282	165	1,993	2,288	3,021	4	18	41	114	154	196
45 weeks	8,361	8,995	6,030	107,335	135,828	160,475	1,256	2,132	9,001	7,692	8,735	13,019

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 8, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended Nov. 8, 1941	Whooping cough, Week ended Nov. 9, 1940
NEW ENG.		
Maine	16	43
New Hampshire	13	1
Vermont	17	27
Massachusetts	172	185
Rhode Island	18	4
Connecticut	66	94
MID. ATL.		
New York [1]	459	450
New Jersey	173	137
Pennsylvania	250	541
E. NO. CEN.		
Ohio	222	213
Indiana	9	13
Illinois	215	155
Michigan [3]	257	250
Wisconsin	252	195
W. NO. CEN.		
Minnesota	45	86
Iowa	27	27
Missouri	3	79
North Dakota	9	16
South Dakota	26	5
Nebraska	6	8
Kansas	56	57
SO. ATL.		
Delaware	0	26
Maryland [3]	45	90
Dist. of Col.	6	14
Virginia [1]	87	30
West Virginia	64	29
SO. ATL.—continued		
North Carolina [1]	113	134
South Carolina [1]	34	12
Georgia [1]	19	9
Florida [1]	17	5
E. SO. CEN.		
Kentucky	123	50
Tennessee	15	70
Alabama [1]	8	5
Mississippi [3]	-------	-------
W. SO. CEN.		
Arkansas	10	22
Louisiana [1]	6	6
Oklahoma	4	16
Texas [1]	115	[illegible]
MOUNTAIN		
Montana	43	0
Idaho	4	5
Wyoming	2	4
Colorado	32	17
New Mexico	7	7
Arizona	25	9
Utah [3]	27	27
Nevada	1	0
PACIFIC		
Washington	98	37
Oregon	24	12
California	142	265
Total	3,388	3,591
45 weeks	184,322	142,679

[1] Typhus fever, week ended Nov. 8, 1941, 76 cases, as follows: New York, 3; Virginia, 4; North Carolina, 1; South Carolina, 5; Georgia, 30; Florida, 1; Alabama, 7; Louisiana, 5; Texas, 20.

[2] New York City only.

[3] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended October 25, 1941

This table lists the reports from 130 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	1	5	0	0	0	8	15
New Hampshire:											
Concord	0	------	0	0	0	0	0	1	0	0	8
Nashua	0	------	0	0	0	0	0	0	0	1	8
Vermont:											
Barre	0	------	------	2	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	1	6	15	15	0	9	2	13	198
Fall River	1	------	0	1	0	6	0	0	0	2	26
Springfield	0	------	0	6	0	12	0	1	0	7	21
Worcester	1	------	0	0	7	20	0	0	1	16	57
Rhode Island:											
Pawtucket	0	------	0	1	0	1	0	0	0	0	11
Providence	0	------	0	6	4	3	0	1	0	27	56
Connecticut:											
Bridgeport	0	------	0	0	1	3	0	1	0	4	32
Hartford	0	------	0	0	2	1	0	0	0	0	39
New Haven	0	------	0	13	1	1	0	0	0	7	39
New York:											
Buffalo	0	------	0	1	7	11	0	6	0	29	138
New York	15	4	0	12	64	35	0	55	6	196	1,353
Rochester	0	------	0	0	1	3	0	0	0	0	65
Syracuse	0	------	0	0	1	1	0	1	1	21	42
New Jersey:											
Camden	4	------	0	0	1	2	0	0	2	8	31
Newark	0	2	0	4	0	9	0	8	1	55	87
Trenton	0	------	0	0	0	2	0	3	0	2	41
Pennsylvania:											
Philadelphia	2	1	0	4	12	27	0	17	5	56	362
Pittsburgh	2	------	0	1	10	3	0	7	0	10	155
Reading	0	------	0	0	0	0	0	1	0	2	26
Scranton	0	------	------	0	------	0	0	------	0	0	------
Ohio:											
Cincinnati	1	1	0	1	4	13	0	0	0	18	121
Cleveland	1	4	0	1	11	17	0	11	1	26	220
Columbus	1	1	1	0	2	8	0	3	0	4	90
Toledo	0	------	1	0	1	2	0	4	0	19	72
Indiana:											
Anderson	0	------	0	0	0	0	0	1	0	0	9
Fort Wayne	0	------	0	0	2	1	0	0	0	0	34
Indianapolis	1	------	0	0	12	11	0	2	0	11	104
Muncie	0	------	0	0	2	1	0	0	0	0	14
South Bend	0	------	0	0	0	0	0	0	0	0	14
Terre Haute	0	------	0	0	2	0	0	0	0	0	17
Illinois:											
Alton	0	------	0	0	1	0	0	0	0	1	9
Chicago	8	2	1	17	29	66	0	38	1	121	647
Elgin	0	1	0	0	1	0	0	0	0	0	13
Moline	0	------	0	1	0	1	0	0	0	11	5
Springfield	0	------	0	0	1	2	0	0	0	0	20
Michigan:											
Detroit	3	------	1	8	4	44	0	9	0	56	235
Flint	0	------	0	0	4	4	0	1	1	11	28
Grand Rapids	0	------	0	3	0	0	0	0	0	4	28
Wisconsin:											
Kenosha	0	------	0	0	0	2	0	0	0	7	4
Madison	0	------	0	6	0	1	0	0	0	5	26
Milwaukee	2	1	1	1	3	16	0	1	0	85	96
Racine	0	------	0	0	0	9	0	0	0	7	12
Superior	0	------	0	2	0	1	0	0	0	0	7
Minnesota:											
Duluth	0	------	0	0	0	1	0	0	0	7	27
Minneapolis	0	------	0	2	1	5	0	0	0	25	89
St. Paul	0	------	0	1	3	3	0	0	0	26	54

City reports for week ended October 25, 1941—Continued

State and city	Diphtheria cases	Influenza: Cases	Influenza: Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	0	------	------	0	------	2	0	------	0	0	------
Des Moines	0	------	0	0	0	7	0	0	0	0	35
Sioux City	2	------	------	0	------	0	0	------	0	0	------
Waterloo	0	------	------	0	------	2	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	0	6	10	0	2	0	10	84
St. Joseph	1	------	0	6	2	2	0	0	0	0	18
St. Louis	1	2	0	1	5	6	0	5	0	7	174
North Dakota:											
Fargo	0	------	0	0	0	2	0	0	0	0	8
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	1	------	------	------	0	------	1	4
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	3	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	9
Nebraska:											
Lincoln	0	------	------	2	------	1	0	------	0	0	------
Omaha	2	------	0	0	0	2	0	2	0	0	47
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	0	5
Topeka	0	------	0	0	0	3	0	0	0	1	17
Wichita	0	------	0	2	1	2	0	0	0	1	36
Delaware:											
Wilmington	1	------	0	0	3	6	0	0	1	2	34
Maryland:											
Baltimore	3	4	0	3	7	12	0	10	1	35	204
Cumberland	0	------	0	1	1	1	0	0	0	0	14
Frederick	0	------	0	0	0	1	0	0	0	0	2
Dist. of Columbia:											
Washington	1	1	1	1	5	13	0	15	0	14	231
Virginia:											
Lynchburg	0	------	0	0	1	0	0	1	0	0	10
Norfolk	1	------	0	0	0	2	0	0	1	0	20
Richmond	1	------	0	0	1	0	0	1	0	1	42
Roanoke	0	------	0	0	0	1	0	0	1	5	9
West Virginia:											
Charleston	0	------	0	0	2	0	0	0	0	1	16
Huntington	1	------	------	0	------	1	0	------	0	0	------
Wheeling	0	------	0	14	0	1	0	0	0	2	20
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Wilmington	2	------	0	5	1	0	0	1	0	9	12
Winston-Salem	7	------	0	26	1	4	0	0	0	0	16
South Carolina:											
Charleston	1	1	1	0	1	0	0	0	1	0	24
Florence	0	------	0	0	2	0	0	0	1	0	9
Greenville	0	------	0	0	0	1	0	0	0	0	18
Georgia:											
Atlanta	1	1	0	0	0	7	0	6	1	0	79
Brunswick	0	------	0	0	0	0	0	0	0	0	4
Savannah	0	------	0	0	1	2	0	0	0	0	27
Florida:											
Miami	0	------	0	1	0	1	0	2	0	6	43
St. Petersburg	0	------	0	0	0	0	0	0	0	0	13
Kentucky:											
Ashland	3	------	0	0	0	0	0	0	0	2	4
Covington	1	------	0	0	1	3	0	2	0	0	16
Lexington	0	------	0	0	0	0	0	2	0	2	12
Tennessee:											
Knoxville	0	------	0	0	0	0	0	1	0	0	27
Memphis	0	------	0	2	1	5	0	1	1	9	83
Nashville	0	------	0	0	2	2	0	1	1	3	51
Alabama:											
Birmingham	2	6	1	0	3	5	0	5	0	1	73
Mobile	2	------	3	0	1	0	0	1	0	0	31
Montgomery	0	------	------	0	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	0	------	1	0	------	0	0	------
Little Rock	0	------	0	0	3	0	0	0	0	1	32
Louisiana:											
New Orleans	1	6	0	0	7	3	0	0	4	2	139
Shreveport	1	------	0	0	2	0	0	1	1	0	28
Oklahoma:											
Oklahoma City	2	6	0	0	2	0	0	0	0	0	43
Tulsa	1	------	0	44	3	2	0	2	0	3	25

City reports for week ended October 25, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Texas:											
Dallas	4	------	0	0	2	1	0	1	0	10	59
Fort Worth	5	------	0	0	1	0	0	1	0	2	37
Galveston	1	------	0	0	0	1	0	0	0	1	18
Houston	1	------	0	0	6	1	0	7	0	1	84
San Antonio	0	1	0	1	3	8	0	10	0	10	55
Montana:											
Billings	1	------	0	0	1	0	0	0	0	0	11
Great Falls	0	------	0	3	2	5	0	0	0	2	13
Helena	0	------	0	0	0	0	0	0	0	0	2
Missoula	0	------	0	1	0	0	0	0	0	3	4
Colorado:											
Colorado Springs	0	------	0	0	0	0	0	0	0	5	7
Denver	4	12	0	4	2	2	0	1	0	23	71
Pueblo	0	------	0	24	0	0	0	1	0	2	5
New Mexico:											
Albuquerque	0	------	0	0	1	1	0	0	0	0	7
Utah:											
Salt Lake City	0	------	0	1	3	5	0	0	1	5	32
Washington:											
Seattle	0	------	0	0	5	3	0	8	0	23	93
Spokane	0	------	0	0	4	6	0	0	0	0	31
Tacoma	0	------	0	0	1	1	0	1	0	0	38
Oregon:											
Portland	3	2	0	1	8	1	0	2	1	0	90
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	4	13	0	25	7	28	0	13	2	23	332
Sacramento	0	------	0	0	3	2	0	0	0	1	38
San Francisco	1	2	0	0	5	6	0	9	0	10	179

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Connecticut:				Delaware:			
Bridgeport	0	0	1	Wilmington	0	0	1
New York:				Maryland:			
Buffalo	0	0	1	Baltimore	3	0	0
New York	0	0	12	District of Columbia:			
Rochester	0	0	7	Washington	0	0	5
Syracuse	0	0	1	Virginia:			
New Jersey:				Norfolk	0	0	1
Newark	0	0	2	West Virginia:			
Pennsylvania:				Huntington	0	0	3
Philadelphia	3	0	4	South Carolina:			
Pittsburgh	1	0	0	Charleston	0	0	1
Ohio:				Tennessee:			
Cincinnati	1	0	1	Memphis	0	0	2
Cleveland	0	0	2	Nashville	0	0	6
Toledo	0	0	1	Oklahoma:			
Illinois:				Tulsa	0	0	1
Chicago	1	0	11	Texas:			
Michigan:				San Antonio	0	0	2
Detroit	1	0	6	Montana:			
Minnesota:				Great Falls	0	0	1
Duluth	0	0	2	Colorado:			
Minneapolis	0	0	5	Denver	0	0	1
St. Paul	0	0	2	Washington:			
Iowa:				Seattle	0	0	3
Des Moines	1	0	0	California:			
Missouri:				Los Angeles	0	0	1
St. Louis	0	0	1	San Francisco	1	0	0
South Dakota:							
Aberdeen	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Philadelphia, 1; Sioux City, 1; Baltimore, 1; Norfolk, 1. Deaths: New York, 1.

Pellagra.—Cases: Charleston, S. C., 4; New Orleans, 1; Dallas, 1.

Typhus fever.—Cases: New York, 1; Norfolk, 1; Savannah, 2; Miami, 2; Mobile, 3; New Orleans, 3; Houston, 2.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,747,694)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
Week ended Oct. 25, 1941	13.13	10.04	1.70	32.76	47.28	80.50	0.00	43.11	5.56	168.26
Average for week, 1936-40	21.86	11.40	4.22	65.11	61.68	101.65	0.62	48.72	6.25	151.62

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended October 4, 1941.—During the week ended October 4, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	------	3	------	1	8	------	1	2	4	19
Chickenpox	------	2	------	37	68	19	5	3	22	156
Diphtheria	------	15	3	39	3	3	------	------	------	63
Dysentery	------	------	------	26	3	------	------	------	------	29
Influenza	------	3	------	------	------	1	15	------	48	67
Lethargic encephalitis	------	------	------	------	------	------	[1] 14	------	------	[1] 14
Measles	------	4	------	110	33	2	20	5	9	183
Mumps	------	------	------	104	51	12	15	------	27	209
Pneumonia	------	6	------	------	6	2	------	------	3	17
Poliomyelitis	------	2	25	2	11	5	5	3	2	55
Scarlet fever	------	22	2	130	98	12	28	12	18	322
Tuberculosis	7	12	3	77	42	2	20	------	------	163
Typhoid and paratyphoid fever	------	------	5	37	3	1	7	3	2	58
Whooping cough	------	3	2	166	103	2	11	1	13	301

[1] Encephalomyelitis.

CUBA

Habana—Communicable diseases—4 weeks ended October 18, 1941.—During the 4 weeks ended October 18, 1941, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	10	1	Scarlet fever	1	------
Leprosy	1	------	Tuberculosis	2	1
Malaria	11	------	Typhoid fever	24	1
Measles	17	------			
Poliomyelitis	1	------			

FINLAND

Communicable diseases—August 1941.—During the month of August 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	142	Poliomyelitis	6
Dysentery	4	Scarlet fever	129
Influenza	208	Typhoid fever	43
Paratyphoid fever	185		

INDIA

Rangoon—Vital Statistics, 1940.—During 1940, a total of 13,569 deaths were registered in Rangoon, or 33.9 per 1,000 population, as compared with 11,327 deaths in 1939, giving a death rate of 28.3. (Rates calculated on the census population of 1931.)

The numbers of deaths due to certain specific diseases were as follows (1939 figures in parentheses): Smallpox 354 (68)—average for 10 preceding years, 97; plague 7 (6); beriberi 60 (116); pulmonary tuberculosis 743 (632); diarrhea and dysentery 1,141 (728); malaria 157 (121); acute respiratory diseases 3,211 (2,648).

The number of births reported was 12,519 as compared with 11,511 in 1939, the respective birth rates being 31.3 and 28.8 per 1,000 population (1931 census). The infant mortality rate was 275.0 as compared with 270.5 for the preceding year.

SCOTLAND

Vital statistics—Quarter ended June 30, 1941.—Following are provisional vital statistics for Scotland for the quarter ended June 30, 1941:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	12,378	9.7	Deaths from—Continued.		
Births	23,420	18.3	Influenza	117	.10
Deaths	18,996	15.4	Lethargic encephalitis	3	
Deaths under 1 year of age	1,965	[1] 84	Measles	22	.02
Deaths from:			Nephritis, acute and chronic	382	
Appendicitis	52		Pneumonia (all forms)	858	.70
Cancer	2,160	1.79	Poliomyelitis	4	
Cerebral hemorrhage and apoplexy	1,163		Puerperal sepsis	44	
Cerebrospinal fever	113	.09	Scarlet fever	7	.006
Cirrhosis of the liver	33		Senility	603	
Diabetes mellitus	175		Suicide	116	
Diarrhea and enteritis (under 2 years of age)	169		Syphilis	59	
Diphtheria	117	.10	Tetanus	2	
Dysentery	9		Tuberculosis (all forms)	1,190	.96
Erysipelas	4		Typhoid and paratyphoid fever	8	.007
Heart disease	4,209		Whooping cough	269	.22
Homicide	1				

[1] Per 1,000 live births.

NOTE.—All deaths in the above table are for civilians only.

SPAIN

Typhus fever, 1941.—The following figures showing the number of cases of typhus fever reported from the various provinces of Spain during the first 8 months of 1941 have been furnished by Dr. John H. Janney, of the International Health Division of the Rockefeller Foundation:

Cases of typhus fever reported in Spain by provinces, for 1941 through the last week in August

(C represents capital of the province; P, province outside the capital)

Locality		Total cases, Jan.-Aug. 29	First case reported, week ended—	Last case reported, week ended—
Alava	C	80	June 7	June 22
	P	1		
Albacete	P	1		
Alicante	P	22	Apr. 26	May 19
Almeria	C	194	Mar. 1	Aug. 23
	P	157	Mar. 29	Aug. 16
Avila	C	2	June 15	June 22
	P	20	Aug. 2	Aug. 16
Badajoz	C	6	May 3	May 19
	P	19	June 29	Aug. 2
Barcelona	P	1		
Burgos	C	32	Apr. 5	May 19
Cadiz:				
Algeciras		299	Apr. 12	Aug. 23
Province		179	May 12	Aug. 23
Ciudad Real	C	17	Apr. 12	Aug. 9
	P	113	May 3	Aug. 23
Cordoba	C	202	Apr. 5	Aug. 23
	P	46	May 19	Aug. 9
Cuenca	C	2	May 24	July 19
	P	15	June 7	Aug. 2
Granada	C	431	Mar. 1	Aug. 23
	P	473	Mar. 22	Aug. 23
Guipuzcoa	C	1		
Huelva	C	19	May 19	Aug. 9
	P	16	May 31	June 26
Jaen	P	119	Apr. 26	Aug. 23
Leon	C	26	June 29	Aug. 23
Madrid	C	2,243	Feb. 15	Aug. 23
	P	145	Mar. 8	Apr. 26
Malaga	C	1,793	Mar. 22	Aug. 23
	P	63	Apr. 5	Aug. 23
Melilla	C	302	Apr. 26	Aug. 23
Murcia	C	140	Feb. 1	June 29
	P	125	Feb. 1	Aug. 2
Palencia	C	18	Aug. 9	Aug. 23
Santander	C	1		
Segovia	C	2	Apr. 5	May 3
Seville	C	1,108	Mar. 29	Aug. 23
	P	87	Apr. 12	Aug. 16
Teruel	C	3	May 24	May 31
Toledo	P	3		
Valencia	C	270	Apr. 19	Aug. 16
	P	98	Apr. 19	Aug. 23
Valladolid	C	2	May 3	May 19
Vizcaya	C	1	May 29	
Zamora	P	5	Apr. 26	May 29
Zaragoza	C	1	June 15	
	P	3	June 15	Aug. 2
Total		8,906		

SWITZERLAND

Notifiable diseases—June–July 1941.—During the months of June and July 1941, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	June	July	Disease	June	July
Cerebrospinal meningitis	15	19	Mumps	70	84
Chickenpox	192	233	Paratyphoid fever	11	12
Diphtheria	44	51	Poliomyelitis	23	113
Dysentery	1		Scarlet fever	221	190
German measles	265	98	Tuberculosis	331	344
Influenza	9	7	Typhoid fever	9	9
Lethargic encephalitis	1	3	Undulant fever	14	16
Malaria	1		Whooping cough	193	207
Measles	417	236			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Burma.—During the 5-week period ended August 30, 1941, 1,036 new cases of cholera, with 751 deaths were reported in Burma. A severe epidemic of cholera was stated to have broken out in the Akyab and Kyankpyn Districts, where several villages were reported to have been seriously affected. An epizootic among cattle was also reported, which was stated to have caused the death of more than 1,000 head.

Plague

Brazil—State of Bahia.—Several cases of plague have recently been reported in the State of Bahia, Brazil, occurring at Conquista, Condeuba, and Irece (formerly Carahyba). All of these localities are in the interior. No cases have been reported at the port of Bahia. Four deaths from plague were reported in the State of Bahia during the period January–May 1941.

Yellow Fever

French Guinea—Kissidougou.—On October 28, 1941, 1 fatal case of yellow fever was reported in Kissidougou, French Guinea.

Sudan (French).—Yellow fever was reported in French Sudan as follows: November 2, 1941, 1 suspected case in Kati, and on October 31, 1941, 1 suspected case in Kouremale.

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93, title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

THE PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 NOVEMBER 21, 1941 NUMBER 47

IN THIS ISSUE

Communicable Disease Control by State Agencies

O. turicata and Relapsing Fever in New Mexico

CONTENTS

// Public Health Reports

Vol. 56 • NOVEMBER 21, 1941 • *No. 47*

DISTRIBUTION OF HEALTH SERVICES IN THE STRUCTURE OF STATE GOVERNMENT *

CHAPTER II. COMMUNICABLE DISEASE CONTROL BY STATE AGENCIES

By JOSEPH W. MOUNTIN, *Assistant Surgeon General*, and EVELYN FLOOK, *United States Public Health Service*

"Distribution of Health Services in the Structure of State Government" is the subject of a study recently made by the United States Public Health Service in response to a request by the State and Territorial Health Authorities for a current revision of Public Health Bulletin No. 184. Results of this study are being published serially in the PUBLIC HEALTH REPORTS. The initial article * presented an over-all picture of State organization for the promotion and conservation of human health and listed a number of specific activities which would be accorded separate treatment in successive chapters. The present discussion is based upon the aggregate effort of official State agencies for the control of communicable disease.

In a study devoted to health activities of the various agencies of State government, it is only fitting that provisions for the control of the communicable diseases should receive first consideration. Notwithstanding the shift in emphasis whereby more and more attention is being given to improvement of the personal health of every citizen, the traditional public health services such as community sanitation, regulation of water and milk supplies, and the control of transmissible diseases still constitute basic responsibilities of health departments. It is upon the results of these older activities which are more closely identified with the health of the community as a whole that a foundation for the more recently included services is laid. Control of transmissible diseases is equally as important today as in the past; it is still the primary function of a health department and, as such, should have precedence over all others. The chief difference in its relation to other types of health work is that in former years it was one of a few health interests; today, it is one of many.

Because of the magnitude of the programs and the special techniques involved, State provisions for the control of tuberculosis and the

* From the States Relations Division. This is the second chapter of the third edition of Public Health Bulletin No. 184. The previous chapter is:

Mountin, Joseph W., and Flook, Evelyn: Distribution of health services in the structure of State government. Chapter I. The composite pattern of State health services. Pub. Health Rep., 56: 1673 (August 22, 1941).

Succeeding chapters will be published in subsequent issues of the PUBLIC HEALTH REPORTS.

venereal diseases will be analyzed separately in later articles, while pneumonia control activities at the State level will be covered under the subject of general medical care. Activities for the control of diseases commonly classed as the general communicable illnesses such as scarlet, typhoid, Rocky Mountain spotted, and undulant fevers, diphtheria, smallpox, measles, chickenpox, influenza, whooping cough, poliomyelitis, dysentery, malaria, hookworm, and plague—in fact, all transmissible diseases except the three previously mentioned—will be described herewith. All comments pertain, of course, only to the work of State agencies. Inquiry was not extended to the local health jurisdictions; consequently, the absence of a particular service in the State scheme does not necessarily mean that such service is unavailable; it may, or may not, be provided through other agencies. Services rendered by the district offices of a State agency are included since these district units represent only a decentralization of the main staff. Complete programs of the State oganizations are considered, regardless of the source of the funds (chiefly State appropriations and Federal grants) which support them. No evaluation of programs is attempted as this study is purely descriptive in its purposes.

VARIATION IN PROCEDURES FOR COMMUNICABLE DISEASE CONTROL

Activities for the control of communicable disease to a large extent are concentrated within the health department. In somewhat less than half of the 53 jurisdictions (the 48 States, District of Columbia, Territories of Alaska, Hawaii, and Puerto Rico, and the Virgin Islands making up the jurisdictions), the health department is the only State or Territorial agency concerned with the communicable disease situation. This is not surprising, inasmuch as reduction in the number and severity of epidemics constituted the original purpose for establishing most of these health departments. What is more surprising, perhaps, is the fact that, for the country as a whole, eight other agencies of State [1] government participate in some way in communicable disease control. Within an individual State, the maximum number of agencies represented in the complete State communicable disease plan is four, an arrangement occurring but twice. Three-agency programs operate in 9 States and two-agency programs in 18.

Departments of welfare, agriculture, and education; special commissions such as those concerned with domestic animals and dairy and food products; independent State hospitals and laboratories; State universities and colleges; and boards of entomology are governmental units which in some way strive to lower the incidence of communicable illnesses. The States [1] in which the several agencies function are recorded in table 1. The State department of health, of

[1] The term "State" as used in the discussion which follows includes the States, the Territories, the

course, operates in every jurisdiction. In 15 States the department of education has specifically defined responsibilities; in 8, the State university participates; and in 6, the department of welfare contributes to some phase of the total State plan for communicable disease control. Participation by State agencies of other types occurs less frequently.

TABLE 1.—*Official State agencies participating in the communicable disease programs of each State and Territory, the District of Columbia, and the Virgin Islands* *

State or Territory	Department of State government								
	Health	Welfare, social security, or public assistance	Agriculture	Education	Special commissions [a]	Independent State hospital or laboratory	State university or college	State board of entomology	Other
Alabama	X			X					
Arizona	X					X			
Arkansas	X						X		
California	X								
Colorado	X						X		
Connecticut	X				X				
Delaware	X	X		X					
District of Columbia	X			X					X
Florida	X		X	X					
Georgia	X								
Idaho [b]	X	X							
Illinois	X								
Indiana	X	X		X			X		
Iowa	X						X	X	
Kansas	X								
Kentucky	X								
Louisiana	X			X		X			
Maine [b]	X								
Maryland	X			X					
Massachusetts	X		X						
Michigan	X								
Minnesota	X						X		
Mississippi	X								
Missouri	X								
Montana	X							X	
Nebraska	X								
Nevada	X								
New Hampshire	X								
New Jersey	X								X
New Mexico	X								
New York	X			X					
North Carolina	X								
North Dakota	X								
Ohio	X						X		
Oklahoma	X								
Oregon	X								
Pennsylvania	X								
Rhode Island	X	X		X					
South Carolina	X								
South Dakota	X								
Tennessee	X			X					
Texas	X			X					
Utah	X			X					
Vermont	X								
Virginia	X		X	X			X		
Washington	X	X							
West Virginia	X	X	X						
Wisconsin	X			X			X		
Wyoming	X								
Alaska	X								
Hawaii	X								
Puerto Rico	X			X					X
Virgin Islands	X								X

* Any differences between information presented in this table and corresponding entries in table 1, ch. I, of this series are the result of combining several activities originally shown separately, or of further refine-

[a] Dairy and food commission, domestic animal commission.

[b] The department of health is really a division (Idaho) and bureau (Maine) of public health, subordinate to the department of welfare (Idaho) and the department of health and welfare (Maine).

That State communicable disease control for the entire country is in the hands of nine different types of official agencies is an interesting finding, but the record of distribution of service would not be complete without some statement as to the manner in which the several agencies operate. Generally speaking, a State governmental agency may be said to function in one or a combination of the following methods: It has regulatory authority; it does promotional and educational work; it advises and supervises subsidiary local units; it gives financial aid to local units; or it operates a direct service program. There is no common pattern of organization. The total State effort may include any one or any combination of the forms of service listed. Where several agencies participate, there may be clearly defined division of responsibility. On the other hand, two or three different agencies may perform one certain branch of service, while other aspects are entirely ignored or adjudged as being beyond the realm of State jurisdiction. Table 2 is constructed to show variation among the several States in their measures for communicable disease control and in the agency charged with each specific service.

TABLE 2.—*Department of State government* responsible for specific activities** designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*

Activity	State or Territory							
	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1[b]	1	1	1[b]	1[b]	1	1	9
Promotes local programs of control	1	1	1	1	1	1	1	----
Conducts educational programs in communicable disease control	1, 4	1	1	1	1	1	1, 4	1, 4
Supervises and provides consultation service to local organizations	1	1	1	1	1	1	1	----
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	1[c]	1[c]	1[c]	1[c]	1[c]	1[c]	1[c]	----
Operates a direct service program:								
Collects and analyzes reports of communicable diseases	1	1	1	1	1	1	1	1
Collects reports of all immunizations performed—								
By local health units	1	1	1	----	1	----	1	----
By private physicians	----	----	----	----	1[g]	----	----	----
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	1[e]	1[c]	----	1	----	----	1	----
Performs immunizations—								
Routinely	----	----	----	1			1	1
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment—								
Smallpox vaccine	----	1	1	----	1	1	1	1[e]
Typhoid vaccine	1	1	1	1	1[c]	1	1	1[e]
Rabies vaccine	1	----	1	----	----	----	1[c]	
Whooping cough vaccine	----	1	----	----	----	----		----
Toxin for Schick test	1	----	1	----	1	1	1	
Toxoid for diphtheria immunization	1	1	1	----	1	1	1	1[e]
Diphtheria antitoxin	1[e]	----	1	----	1	1	1	1[e]
Tetanus antitoxin	----	----	1	----	----	1	----	----
Scarlet fever antitoxin	----	----	----	----	----	1	----	----
Convalescent serums	----	----	----	----	----	----		----
Quinine	1	----	----	----	----	----	----	----
Carbon tetrachloride	1	----	----	----	----	----	----	----
Tetrachlorethylene		----	----	----	----	----		----
Silver nitrate	1	----	1	1	1	1	1	1
Other	1[j]	----	----	----	----	1[k]	1[k,l]	----
Supplies clinical diagnostic service to local health officers	1	1	1	1	1	1	1	----
Provides diagnostic laboratory service to private physicians and local health officers	1	6	1	1	1	1	1	1
Does epidemiological work in the field—								
Routinely	----	----	----	1	----	1[e]	1[e]	1
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Hospitalizes communicable disease patients	----	----	7	----	7			1
Provides for care or treatment of typhoid carriers		----	----		----	1		----
Restricts activities of typhoid carriers requires registration, periodic check-up, etc	1	1	1	----	1	1		1
Makes studies of hookworm infestation	1	----	----	----	----	----		----
Makes studies to determine prevalence and distribution of malaria—								
Blood smears	1	----	1	----	----	----		----
Splenometric surveys	----	----	----	----	----	----	----	----
Investigates suspected anopheline breeding areas	1	----	1	1	----	----	----	9
Participates in drainage and/or larvicidal projects for malaria control	1	----	----	----	----	----	----	9
Exchanges with other State agencies information regarding diseases with animal reservoirs—								
Routinely	----	----	----	1	1[e]	1, 5	1	1
Upon occasion only	1	1	----	----	----	----	----	----
Renders additional service not covered in this classification	1	1	----	1	----	----	2	----

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Florida	Georgia	Idaho[a]	Illinois	Indiana	Iowa	Kansas	Kentucky
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1	1[b]	1, 2	1[b]	1	1	1	1
Promotes local programs of control	1	1	1	1	1, 2	1	1	1
Conducts educational programs in communicable disease control	1, 4	1	1	1	1, 2, 4	1	1	1
Supervises and provides consultation service to local organizations	1	1	1	1[d]	1, 2	1	1	1
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	1[e]	1[e]	1[e]	1[e]	1[e]	1[e]	1[e]	1[e]
Operates a direct service program:								
Collects and analyzes reports of communicable diseases	1[f]	1	1	1	1	1	1	1
Collects reports of all immunizations performed —								
By local health units	1	1	1		1	1	1	1
By private physicians	-							-
Makes surveys or uses other devices to determine population protected by immunization against specific diseases		-	1	1[b]		1		1
Performs immunizations —								
Routinely						1		-
Upon request and/or in emergencies	1	1	1	1	1	1[e]	1	1
Furnishes free biologicals and drugs for immunization or treatment —								
Smallpox vaccine	1	1[i]	1	1	1[e]	1	1	1
Typhoid vaccine	1	1	1	1	1[e]	1	1	1
Rabies vaccine	1[e]	1	1	1	1			
Whooping cough vaccine		-	1					
Toxin for Schick test	1	1	1	1		1		1
Toxoid for diphtheria immunization	1	1[e]	1	1	1[e]	1	1	1
Diphtheria antitoxin	1[e]	1	1	1	1[e]	1		-
Tetanus antitoxin	-	-	-	-				-
Scarlet fever antitoxin		-	-					-
Convalescent serums			-				1	-
Quinine		-	-					-
Carbon tetrachloride		1						-
Tetrachlorethylene	1	1						
Silver nitrate	1	1		1	1	1	1	1
Other	1[m]		1[l]					
Supplies clinical diagnostic service to local health officers	1	1	1	1	1	1	1	1
Provides diagnostic laboratory service to private physicians and local health officers	1	1	1	1	1	1	1	1
Does epidemiological work in the field								
Routinely		1		1	1		1	1
Upon request and/or in emergencies		1	1	1	1	1[e]	1	1
Hospitalizes communicable disease patients					2, 7	7		
Provides for care or treatment of typhoid carriers	-							-
Restricts activities of typhoid carriers, requires registration, periodic check-up, etc		1		1	1	1	1	1
Makes studies of hookworm infestation	1	1	-					-
Makes studies to determine prevalence and distribution of malaria—								
Blood smears	1	1	-					-
Splenometric surveys	1	1						-
Investigates suspected anopheline breeding areas	1	1	1	1	1	1, 8	-	-
Participates in drainage and/or larvicidal projects for malaria control	1	1	-	1	-	-	-	-
Exchanges with other State agencies information regarding diseases with animal reservoirs —								
Routinely	1, 3	1	1	1	1	1	-	1
Upon occasion only	-	-	-	-	-	-	1	-
Renders additional service not covered in this classification	1	1	-	1		-		-

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Louisiana	Maine [a]	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1[t]	1	1 4	1	1	1[b]	1[t]	1[t]
Promotes local programs of control	1	1	1	1	1	1	1	1
Conducts educational program in communicable disease control	1 4	1	1 4	1	1	1	1	1
Supervises and provides consultation service to local organizations	1	1	1	1	1	1	1	1
Distributes and/or administers financial grants in aid to local health units for communicable disease control	1[e]		1[e]	1[e]	1[e]	1[e]	1[e]	1[e]
Operates a direct service program:								
Collects and analyzes reports of communicable disease	1	1	1	1	1	1	1	
Collects reports of all immunizations performed:								
By local health units	1		1	1[e]	1	1	1	1
By private physicians						1[f]		1[g]
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	1[e]			1[c]		1		1
Performs immunizations:								
Routinely		1	1		1[i]			
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment:								
Smallpox vaccine	1		1	1	1	1	1	1
Typhoid vaccine	1	1	1	1	1	1	1	1
Rabies vaccine		1	1		1			
Whooping cough vaccine					1			
Toxin for Schick test	1		1	1	1	1		1
Toxoid for diphtheria immunization	1		1	1	1	1	1	1
Diphtheria antitoxin			1	1	1	1		
Tetanus antitoxin			1		1			
Scarlet fever antitoxin			1[a]	1	1			
Convalescent serums								
Quinine								-
Carbon tetrachloride								
Tetrachlorethylene							1	
Silver nitrate	1	1	1	1	1	1	1	1
Other				1[k]	1[k,l]	1[k]		
Supplies clinical diagnostic service to local health officer	1	1	1	1	1	1	1	1
Provides diagnostic laboratory service to private physicians and local health officer	1	1	1	1	1	1	1	1
Does epidemiological work in the field:								
Routinely		1	1	1		1		
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Hospitalizes communicable disease patients	6							
Provides for care or treatment of typhoid carriers		1	1	1	1	1		
Restricts activities of typhoid carriers, requires registration, periodic check-up, etc.			1			1	1	1
Makes studies of hookworm infestation								
Makes studies to determine prevalence and distribution of malaria:								
Blood smears							1	
Splenometric surveys								
Investigates suspected anopheline breeding areas	1					1 7	1	1
Participates in drainage and/or larvicidal projects for malaria control	1						1	-
Exchanges with other State agencies information regarding diseases with animal reservoirs—								
Routinely		1	1	1 3	1	1		1
Upon occasion only					-		1	
Renders additional services not covered in this classification	1			1	-	1		

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1[b]	1[b]	1	1	1[b]	1	1, 4	1
Promotes local programs of control	1	1	1	1	1	1	1	1
Conducts educational programs in communicable disease control	1	1	1	1	1	1	1	1
Supervises and provides consultation service to local organizations	1	1[d]	1[d]	1	1[d]	1	1	1
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	1[e]	-	-	1[e]	1[e]	1[e]	1[e]	1[e]
Operates a direct service program:								
Collects and analyzes reports of communicable diseases	1	1[f]	1	1[f]	1	1[f]	1	1
Collects reports of all immunizations performed—								
By local health units	1	-	1	-	1[g]	1	1[e]	1
By private physicians	-	-	-	-	1[g]	-	1[e]	-
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	-	-	-	-	1	1[e]	1	-
Performs immunizations—								
Routinely	-	-	1	1	-	-	1	-
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment—								
Smallpox vaccine	1	-	-	1[e]	1[e]	-	-	1
Typhoid vaccine	1	-	1[e]	1[e]	-	-	1	1
Rabies vaccine	1	-	-	-	-	-	-	1[e]
Whooping cough vaccine	-	-	-	-	-	-	1	1
Toxin for Schick test	1	-	-	1	-	-	1	1
Toxoid for diphtheria immunization	1	-	-	1	1[e]	-	1	-
Diphtheria antitoxin	-	-	1	1	-	-	1	-
Tetanus antitoxin	-	-	-	-	-	-	1	1
Scarlet fever antitoxin	-	-	-	-	-	-	1	-
Convalescent serums	-	-	-	-	-	-	-	-
Quinine	-	-	-	-	-	-	-	-
Carbon tetrachloride	-	-	-	-	-	-	-	-
Tetrachlorethylene	-	-	-	-	-	-	-	-
Silver nitrate	1	-	1	1	1	1	-	1
Other	1[i]	-	-	-	-	-	-	-
Supplies clinical diagnostic service to local health officers	1	1	1	1	1	1	1	1
Provides diagnostic laboratory service to private physicians and local health officers	1	1	1	1	1	1	1	1
Does epidemiological work in the field—								
Routinely	-	-	-	1[e]	1	-	1	-
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Hospitalizes communicable disease patients	-	-	-	-	-	-	-	-
Provides for care or treatment of typhoid carriers	-	-	-	-	-	-	1	-
Restricts activities of typhoid carriers—requires registration, periodic check-up, etc	-	-	-	1	1	1	-	1
Makes studies of hookworm infestation	-	-	-	-	-	-	-	-
Makes studies to determine prevalence and distribution of malaria—								
Blood smears	-	-	-	-	-	1	-	1
Splenometric surveys	-	-	-	-	-	-	-	-
Investigates suspected anopheline breeding areas	-	-	-	-	9	1	-	1
Participates in drainage and/or larvicidal projects for malaria control	-	-	-	-	1	1	-	1
Exchanges with other State agencies information regarding diseases with animal reservoirs—								
Routinely	1	-	1	-	-	-	1	-
Upon occasion only	-	1	-	1	1	1	-	1
Renders additional service not covered in this classification	1, 8	-	-	-	-	-	-	-

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1	1[b], 7	1[b]	1	1	1[b], 4[c]	1	1[b]
Promotes local programs of control	1	1	1	1		1	1	1
Conducts educational programs in communicable disease control	1	1	1	1	1	1	1	1
Supervises and provides consultation service to local organizations	1	1	1	1	1	1	1	1
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	1[e]	1[e]	1[e]	1[e]			1[e]	1[e]
Operates a direct service program:								
Collects and analyzes reports of communicable diseases	1	1	1[f]	1	1	1	1[f]	1
Collects reports of all immunizations performed—								
By local health units	1	1	1	1			1	1
By private physicians	1							
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	1			1	1	1[c]	1	
Performs immunizations—								
Routinely					1	1		
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment—								
Smallpox vaccine	1		1	1	1		1	1
Typhoid vaccine	1	1	1	1	1[c]	1	1[c]	1
Rabies vaccine	1		1[c]				1	
Whooping cough vaccine			1[c]			1		1[c]
Toxin for Schick test	1		1	1	1			1
Toxoid for diphtheria immunization	1	1[c]	1	1	1		1	1
Diphtheria antitoxin	1[c]		1[c]	1	1	1	1	1
Tetanus antitoxin					1[c]	1		1
Scarlet fever antitoxin								
Convalescent serums								
Quinine								
Carbon tetrachloride								
Tetrachlorethylene								
Silver nitrate	1	1	1		1	1		1
Other								1[l], [n]
Supplies clinical diagnostic service to local health officers	1		1	1	1	1	1	
Provides diagnostic laboratory service to private physicians and local health officers	1	1	1	1	1	1	1	1
Does epidemiological work in the field—								
Routinely					1	1		
Upon request and/or in emergencies	1		1	1	1	1	1	1
Hospitalizes communicable disease patients		7				2[c]		
Provides for care or treatment of typhoid carriers								
Restricts activities of typhoid carriers—requires registration, periodic check-up, etc	1							
Makes studies of hookworm infestation			1					
Makes studies to determine prevalence and distribution of malaria—								
Blood smears							1	
Splenometric surveys							1	
Investigates suspected anopheline breeding areas			1				1	
Participates in drainage and/or larvicidal projects for malaria control			1				1	
Exchanges with other State agencies information regarding diseases with animal reservoirs—								
Routinely						1	1	
Upon occasion only	1		1	1	1			
Renders additional service not covered in this classification							1	

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory							
	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1	1[b]	1	1	1, 4	1, 2	1	1[b], 7
Promotes local programs of control	1	1	1	1	1	1	1	1
Conducts educational programs in communicable disease control	1, 4	1, 4	1, 4	1	1, 4	1	1	1, 4
Supervises and provides consultation service to local organizations	1	1	1	1	1	1	1	1
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	1[c]	1[c]	1[c]	------	1[c]	1[c], 2	1[c]	1[c]
Operates a direct service program:								
Collects and analyzes reports of communicable diseases	1	1	1	1	1	1	1	1
Collects reports of all immunizations performed—								
By local health units	1	1	1	------	1	1	1	1
By private physicians	------	------	------	------	------	------	------	------
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	------	1	------	1	1	------	------	1
Performs immunizations—								
Routinely	1	------	------	1	7	------	------	------
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment—								
Smallpox vaccine	------	1[c]	1[c]	------	------	------	1	------
Typhoid vaccine	1	1[c]	1	1	------	------	1	1
Rabies vaccine	------	1[c]	------	------	------	------	2[c]	------
Whooping cough vaccine	------	------	------	------	------	------	2[c]	1
Toxin for Schick test	1	1[c]	1	1	------	------	1[c]	------
Toxoid for diphtheria immunization	1	1[c]	1[c]	1	------	------	1	------
Diphtheria antitoxin	------	------	------	1	------	------	1, 2[c]	------
Tetanus antitoxin	------	------	------	------	------	------	2[c]	------
Scarlet fever antitoxin	------	------	------	------	------	------	2[c]	------
Convalescent serums	------	------	------	------	------	------	2[c]	------
Quinine	------	------	------	------	------	------	2[c]	------
Carbon tetrachloride	------	------	------	------	------	------	------	------
Tetrachlorethylene	------	------	------	------	------	------	------	------
Silver nitrate	1	1	------	1	1	------	1	1
Other	------	------	------	------	------	------	------	------
Supplies clinical diagnostic service to local health officers	1	1	1	1	1	1	1	1
Provides diagnostic laboratory service to private physicians and local health officers	1	1	1	1	1	1	1	1
Does epidemiological work in the field—								
Routinely	1	------	------	------	1	1[b]	1[b]	1[c]
Upon request and/or in emergencies	1	1	1	1	1	1	1	1
Hospitalizes communicable disease patients	------	------	------	------	------	2	------	7
Provides for care or treatment of typhoid carriers	------	------	------	------	------	------	------	1
Restricts activities of typhoid carriers—requires registration, periodic check-up, etc.	------	1	------	------	------	------	1	1
Makes studies of hookworm infestation	------	------	------	------	------	------	------	------
Makes studies to determine prevalence and distribution of malaria—								
Blood smears	1	1	------	------	1	------	------	------
Splenometric surveys	------	------	------	------	------	------	------	------
Investigates suspected anopheline breeding areas	1	1	------	------	1	------	------	1
Participates in drainage and/or larvicidal projects for malaria control	1	------	------	------	1	------	------	------
Exchanges with other State agencies information regarding diseases with animal reservoirs—								
Routinely	------	1	1	1	1[c], 3[c]	1	1, 3	1
Upon occasion only	1	------	------	------	------	------	------	------
Renders additional service not covered in this classification	1	1	------	------	7	------	------	------

See footnotes at end of table.

TABLE 2.—*Department of State government responsible for specific activities designed to control communicable diseases in each State and Territory, the District of Columbia, and the Virgin Islands*—Continued

Activity	State or Territory				
	Wyoming	Alaska	Hawaii	Puerto Rico	Virgin Islands
Promulgates and enforces State laws, rules, and regulations for communicable disease control	1	1	1	1, 4, 9	1, 9
Promotes local programs of control	1	1	1	1	------
Conducts educational programs in communicable disease control	1	1	1	1	1
Supervises and provides consultation service to local organizations	1	1	1	1	------
Distributes and/or administers financial grants-in-aid to local health units for communicable disease control	------	------	1[e]	------	------
Operates a direct service program—					
Collects and analyzes reports of communicable diseases	1	1	1[f]	1	1[f]
Collects reports of all immunizations performed—					
By local health units	------	1	1	1	------
By private physicians	------	------	1	------	------
Makes surveys or uses other devices to determine population protected by immunization against specific diseases	------	1	1	------	------
Performs immunizations—					
Routinely	1	1	1	1	1
Upon request and/or in emergencies	1	1	1	1	1
Furnishes free biologicals and drugs for immunization or treatment—					
Smallpox vaccine	1	1	1	1	1
Typhoid vaccine	1	1	1	1	1
Rabies vaccine	1	------	------	1	------
Whooping cough vaccine	------	1	------	------	------
Toxin for Schick test	1	1	1[c]	------	------
Toxoid for diphtheria immunization	1	1	1	1	------
Diphtheria antitoxin	------	1	1[c]	1	1[c]
Tetanus antitoxin	------	1	1	1	1[c]
Scarlet fever antitoxin	------	------	1	------	------
Convalescent serums	------	------	------	------	------
Quinine	------	------	------	1	1[c]
Carbon tetrachloride	------	------	------	1	------
Tetrachlorethylene	------	------	------	------	------
Silver nitrate	------	1	1	1	1
Other	------	1[k]	1[k]	1[o]	------
Supplies clinical diagnostic service to local health officers	1	1	1	1	------
Provides diagnostic laboratory service to private physicians and local health officers	1	1	1	1	1
Does epidemiological work in the field—					
Routinely	1	1[c]	------	1	1
Upon request and/or in emergencies	1	1	1	1	1
Hospitalizes communicable disease patients	------	------	------	------	1
Provides for care or treatment of typhoid carriers	------	------	------	------	------
Restricts activities of typhoid carriers—requires registration, periodic check-up, etc	------	------	1	------	------
Makes studies of hookworm infestation	------	------	------	1	1
Makes studies to determine prevalence and distribution of malaria—					
Blood smears	------	------	------	------	------
Splenometric surveys	------	------	------	------	------
Investigates suspected anopheline breeding areas	------	------	1	1	------
Participates in drainage and/or larvicidal projects for malaria control	------	------	------	1	1
Exchanges with other State agencies information regarding diseases with animal reservoirs—					
Routinely	1	1	1	1	------
Upon occasion only	------	------	------	------	------
Renders additional service not covered in this classification	------	------	------	------	------

For footnotes see p. 2244.

The range of activities included may be taken to represent some confusion as to the means of controlling communicable diseases. Regulatory functions, of course, have long been recognized as an essential measure. In fact, at one time, quarantine was looked upon as the only approach to the communicable disease problem. All States still maintain some sort of regulatory control, though in 8 of them this control is limited to promulgation of rules and regulations, the power of enforcement being delegated to local authorities. In 9 more jurisdictions the State has enforcement power only in the event that local action is inadequate. As to the type of regulatory authority vested in State agencies, and more particularly in State health departments, one may generalize and say that such authority usually extends to establishment and/or enforcement of regulations pertaining to reporting of communicable diseases and to restrictions of mobility of cases and contacts. Some States place special emphasis upon regulatory control of smallpox; 16 jurisdictions, namely, Arkansas, the District of Columbia, Kentucky, Maryland, Massachusetts, New Hampshire, New Mexico, New York, Pennsylvania, Rhode Island, South Carolina, Virginia, West Virginia, Hawaii, Puerto Rico, and the Virgin Islands, have laws which make vaccination compulsory before children may attend school. Twenty-one other areas have enacted legislation or promulgated regulations which enable local areas to draft their own regulations or which require smallpox vaccination only under prescribed conditions, such as "in case of a threatened epidemic," "exposed persons must be vaccinated or quarantined," "if a case occurs in a school or community, all unvaccinated children must be excluded for two weeks," "the State board of health may adopt such

---

FOOTNOTES FOR TABLE 2

* Code:
1. Health department
2. Department of welfare, social security, or public assistance
3. Department of agriculture
4. Department of education
5. Special commission
6. Independent State hospital or laboratory
7. State university or college
8. State board of entomology
9. Other departments of State government

** Activities herein described pertain to the general communicable diseases and exclude tuberculosis, pneumonia, and venereal disease, which are treated separately in this study. Control work for malaria and plague are included even though the control measures are primarily a function of the engineering division. General sanitary measures in relation to communicable disease will be described in subsequent articles devoted to sanitation.

[a] The department of health is really a division (Idaho) and bureau (Maine) of public health, subordinate to the department of welfare (Idaho) and the department of health and welfare (Maine).

[b] Power of enforcement either not included in regulatory authority or limited to situations in which local action is inadequate.

[c] For selected conditions, selected areas, or selected population groups only.

[d] Consultation service only.

[e] As part of grant-in-aid to local health units for general health work.

[f] Collects reports, but does little toward analyzing them.

[g] Of those performed with State-supplied material only.

[h] For demonstrations only.

[i] Charge of 1 cent per point to prevent waste. This represents one-fourth of the actual cost to the State.

[j] Oil of chenopodium.

[k] Antimeningitis serum.

[l] Dick test material.

[m] Insulin.

[n] Cod-liver oil.

[o] Sulfathiazole, staphylococcus vaccine, thromboplastin, and leucocitin.

measures for general vaccination of inhabitants of any city, town, or county as it deems proper and necessary to prevent introduction or arrest progress of smallpox." Alabama, Arizona, Colorado, Connecticut, Georgia, Iowa, Kansas, Louisiana, Maine, Michigan, Minnesota, Mississippi, Montana, New Jersey, North Carolina, Ohio, Oregon, Tennessee, Wisconsin, Wyoming, and Alaska constitute this latter group.

Reference to a recent study by Fowler [2] which involved a thorough search of existing State laws and health department regulations pertaining to the requirements for vaccination against smallpox indicates that data collected in the survey herein reported agree very closely with his findings. Comparison of the current situation with that of a decade ago, as reported by Ferrell, Smillie, Covington, and Mead,[3] reveals only one addition to the group of States with compulsory smallpox vaccination laws, but considerable shifting has taken place in the group having conditional laws or regulations, which frequently represent delegation of responsibility to local political units.

Only three jurisdictions—North Carolina, West Virginia, and Hawaii—have compulsory diphtheria immunization laws. Arkansas, Mississippi, and New Mexico require that certain population groups, "family contacts and known carriers," "all food handlers," and "all susceptibles," respectively, be immunized against typhoid fever.

The communicable disease problem is by no means a static one. Recognizing this, most State health departments frequently revise their rules and regulations in a further effort to eliminate, limit, or abate those conditions which are especially prevalent or serious. A record of the most recently published rules and regulations for communicable disease control in each State follows.

[2] Fowler, William: Principal provisions of smallpox vaccination laws and regulations in the United States Pub. Health Rep, 56 167 (January 31, 1941).

[3] Ferrell, John A., Smillie, Wilson G., Covington, Platt W, and Mead, Pauline A.; International Division of the Rockefeller Foundation for the Conference of State and Provincial Health Authorities of North America: Health Departments of States and Provinces of the United States and Canada. Public Health Bulletin No. 184 (Revised). United States Government Printing Office, Washington, 1932.

State	Year in which communicable-disease regulations were last revised	State	Year in which communicable disease regulations were last revised
Alabama	1936	New Hampshire	1936
Arizona	1929	New Jersey	1940
Arkansas	1940	New Mexico	1936
California	1939	New York	1940
Colorado	1927	North Carolina	1937
Connecticut	1939	North Dakota	1939
Delaware	1938	Ohio	1930
District of Columbia	1940	Oklahoma	1933
Florida	1936	Oregon	1936
Georgia	1925	Pennsylvania	1937
Idaho	Not reported.	Rhode Island	1938
Illinois	1935	South Carolina	1937
Indiana	1930	South Dakota	1940
Iowa	1938	Tennessee	1938
Kansas	1936	Texas	1925
Kentucky	1935	Utah	1937
Louisiana	1932	Vermont	1937
Maine	1937	Virginia	1938
Maryland	1922	Washington	1939
Massachusetts	1938	West Virginia	1935
Michigan	1940	Wisconsin	1940
Minnesota	1938	Wyoming	1930
Mississippi	1940	Alaska	1938
Missouri	1938	Hawaii	1940
Montana	1929	Puerto Rico	Not reported.
Nebraska	1933	Virgin Islands	1915
Nevada	1939		

Examination of these regulations and the more detailed studies by Emerson [4] would indicate, however, that in many instances antiquated and ineffective measures are carried over from one revision to another.

In only about one-fifth of the States is regulatory authority divided between the health department and any other agency of State government. When there is cleavage in general regulatory responsibility for communicable disease control, it is due to a particular set-up which makes the Governor (Puerto Rico and the Virgin Islands), the Board of Commissioners (District of Columbia), or the Board of Welfare (Idaho) responsible for all health laws. The regulatory authority of departments of education and welfare and of State universities which obtains in certain States is restricted to that portion of the program in which the respective agencies are concerned. For instance, in five States the department of education is the agency responsible for enforcement of the compulsory smallpox vaccination law, while occasionally a department of welfare or State university prescribes and/or enforces certain regulations concerning hospitalization of communicable disease patients.

As the value of vaccination and immunization against certain diseases has been demonstrated, many States have concentrated upon promotional and educational programs designed to secure more wide-

[4] Emerson, Haven: State procedures for communicable disease control. Am. J. Pub. Health, 29:701 (July 1939).

Emerson, Haven: The control of communicable diseases. Paper read October 16, 1941, before the Health Officers Section of the American Public Health Association in its seventieth annual meeting at Atlantic City, N. J.

spread protection. Wherever there are local counterparts of the State health department, the State organization is engaged in promotion of local programs of control. Education of the public regarding the most successful methods of combating communicable illnesses represents an important part of the work of every State health department staff. Newspaper releases, radio talks, motion pictures, posters and other exhibits, pamphlets, letters, home visits, and lectures are the educational devices usually employed. Approaches are made to both professional and lay groups, medical societies representing the first, and parent-teacher associations, mothers' clubs, and teacher-training classes, the second. Immunization against diphtheria, smallpox, and typhoid fever is the subject given most emphasis. In nearly one-fourth of the States educational work of the health department is augmented by programs sponsored by the department of education. These latter programs are designed for teachers and school children and stress the importance of immunization and of early diagnosis and segregation of the different diseases.

Provision of advisory and supervisory service to local health units is a practice rather uniformly followed by State health departments. Necessity for including this type of service in the State program is a natural outgrowth of the expansion of organized full-time local health departments. Increased activity at the local level is encouraged by the States' policy of extending financial grants-in-aid to these local units for the carrying on of their work. These grants are not apt to be designated specifically for communicable disease control but are a part of the financial aid given by the State to counties or cities for general health work. Almost exclusively, the health department is the agency charged with this feature of the State program. Such financial participation by the State is closely tied up with the supervisory and advisory service previously mentioned, since aid is extended only when approved methods of control are observed locally.

It would seem, therefore, that insofar as communicable disease control is concerned, State agencies—particularly State health departments—with relative uniformity regard as State responsibility the first four branches of service, namely, regulation, promotion and education, supervision and advice, and financial aid to local units. A basic variation among the States in their organization for communicable disease control rests upon the portion of responsibility for direct service which is borne by the State. Study of the list of direct services presented in table 2 as being rendered by one or more States shows very clearly how far beyond the original idea of quarantine the present conception of communicable disease control has extended.

The first step in communicable disease control is necessarily based upon a knowledge of where and when cases of each kind occur.

422231°—41——3

Collection of reports of communicable illnesses is a function of every State health department. As to frequency and method of collection, however, there is considerably less uniformity. In some instances attending physicians report directly to the State agency; in others, they report through local health officers. Practices observed by each State are briefly described as follows:

Variation in reporting communicable disease to State health departments

State	By whom reported	Frequency of reporting [5]	Payment of fees for reports
Alabama	County health officers	Weekly	No.
Arizona	County superintendents of public health	do	No.
Arkansas	Local health officers	do	No.
California	do	do	No.
Colorado	Local health officers and physicians	do	No.
Connecticut	Local health officers	Daily	No.
Delaware	Physicians	Weekly	No.
District of Columbia.	do	Daily	No.
Florida	Local health officers and physicians	do	No.
Georgia	do	Weekly	No.
Idaho	do	do	No.
Illinois	Local health officers	Daily	No.
Indiana	City, county, and town health officers	Weekly	No.
Iowa	Local health officers	Daily	No.
Kansas	do	Weekly	No.
Kentucky	do	do	No.
Louisiana	Physicians	Daily	No.
Maine	Local health officers	Weekly	No.
Maryland	do	Daily	No.
Massachusetts	Local boards of health	do	No.
Michigan	Local health officers	do	No.
Minnesota	do	do	No.
Mississippi	County health officers	Weekly and monthly.	No.
Missouri	Local health officers	Weekly	No.
Montana	do	do	No.
Nebraska	County, city, or village boards of health	do	No.
Nevada	County health officers	do	No.
New Hampshire	Local health officers	do	No.
New Jersey	do	Daily	Yes.
New Mexico	do	do	No.
New York	do	do	Yes.
North Carolina	County quarantine officers	do	Yes. [6]
North Dakota	Local health officers	Weekly	No.
Ohio	Local health commissioners	do	No.
Oklahoma	County health officers	do	No.
Oregon	Local health officers and physicians	do	No.
Pennsylvania	Department and municipal health officers [7]	Daily and weekly [7]	No.
Rhode Island	Local health officers	Weekly	No.
South Carolina	Local health officers and physicians	Daily and monthly. [8]	Yes.
South Dakota	Local health officers	Daily	No.
Tennessee	Local health officers and physicians	Weekly	No.
Texas	Local health officers	do	No.
Utah	do	do	No.
Vermont	Local health officers and physicians	do	Yes
Virginia	do	do	No.
Washington	Local health officers	do	No.
West Virginia	do	do	No
Wisconsin	do. [9]	do	Yes.
Wyoming	do	do	No.
Alaska	Local health officers, physicians, and public health nurses.	do	No.
Hawaii	Physicians	do	No.
Puerto Rico	Not specified	do	No.
Virgin Islands	Physicians	Daily	No.

[5] "Frequency of reporting" represents the routine requirement for the general list of notifiable diseases in each State. Furthermore, in all areas certain of the more serious diseases are reportable immediately by telephone or telegraph.

[6] To the part-time officers.

[7] Department health officers report daily for the rural sections. Municipal health officers report weekly for the urban sections.

[8] Physicians reporting directly do so daily, local health officers forward their reports monthly.

[9] Local health officers forward reports of all diseases except poliomyelitis which is reported directly by physicians.

By way of summary, it might be said that State health departments receive their reports directly from physicians; from local health officers (including the officers of counties, cities, towns, villages, or any other political subdivision), who in turn have received them from physicians, school teachers, and parents; or from both physicians and local health officers. When the third policy is followed, physicians report directly only from those sections of the State which have no local health officer. About twice as many States collect reports weekly as receive them daily.

The fact that nearly four-fifths of the States require their local health units to report to the State agency all immunizations performed indicates the importance accorded immunization as an element of communicable disease control. Seven States even extend this requirement to private physicians, but under such circumstances it is customary to have the private practitioner report only immunizations performed with material furnished free of charge by the State. To supplement information obtained from these sources, about one-half of the States make surveys or use other similar devices to determine the proportion of the population which is protected by immunization against specific diseases. As a result, the definite information thus obtained lends greater impetus to the promotional and educational programs previously discussed.

Personnel of all State health departments go into the field for the purpose of actually performing immunizations for demonstration purposes, upon special request, and in emergencies—actual or threatened epidemics representing the "emergencies." However, in over one-third of the States, performance of immunizations is included as a routine duty of the health department staff. Furnishing free immunizing materials to be administered by local personnel is a more usual function of the State agency than routine performance of the immunizations. According to table 2, typhoid vaccine is supplied by more States than any other type of immunizing agent, 48 of the 53 jurisdictions reporting its free distribution. Distribution of silver nitrate for the prevention of ophthalmia neonatorum ranks second and toxoid for diphtheria immunization, third. Forty-four and forty-two States, respectively, supply these materials. Smallpox vaccine, toxin for Schick testing, and antitoxin for diphtheria are each furnished by more than 30 States. Rabies vaccine and tetanus antitoxin are preventive agents which are distributed free by less than half but more than one-fourth of the States. Other drugs and biologicals listed are less frequently provided; the few States which do supply each kind may be identified from table 2.

Variation exists among the States not only as to the type of immunizing agents furnished, but also as to the population groups for which

they are available. The conditions under which they are distributed may be described in one of several ways: (1) No restrictions—available to all physicians and local health units for any person; (2) available to all physicians and local health units for medical indigents only; (3) available to local health units for their clients only; (4) available to any physician for group immunizations. A State does not necessarily follow a constant procedure for all types of material that it provides. Some may be furnished under one of the conditions mentioned while others are distributed under different circumstances.

In almost every instance, personnel attached to the State health department staff are available to local health officers and to private physicians for aid in the clinical diagnosis of communicable disease but there are wide differences among the States in the extent to which this service is used. Diagnostic laboratory service is provided consistently by State agencies also. The same intensity of service does not obtain in all States or all parts of particular States. Furthermore, the character of the examinations varies according to the diseases that are prevalent in the several regions. In another chapter devoted exclusively to "laboratory service" the several aspects of this service will be considered in greater detail.

Field epidemiological work is generally recognized as a function of the State health department in the event of emergencies or upon the special request of local health officers or private physicians. About half of the States do not limit their epidemiological work to these occasions but include such service: Without qualification throughout the State; as a routine health department duty for areas without organized local health service; or for selected diseases—usually typhoid fever, poliomyelitis, smallpox, Rocky Mountain spotted fever, tularemia, or undulant fever.

Facilities for the hospitalization of communicable disease patients are provided by about one-fifth of the States. The State university hospital is the place most often utilized for this service. Several departments of welfare and health departments, and one independent State hospital also accept persons suffering from communicable illnesses.

The foregoing services offered by departments of State government for prevention and control of communicable diseases pertain to the problem in general. Brief consideration will now be given to selected items of service performed by the States for the control of particular diseases. The matter of typhoid carriers is the first example. Almost half of the States restrict the activities of typhoid carriers by requiring registration, periodic check-ups, and the like. This, of course, is for protection of the community where the individual resides. Insofar as providing care or treatment for the carrier himself is concerned, however, only eight States assume any responsibility.

Hookworm and malaria are two transmissible illnesses, the prevalence of which is more or less restricted to the southern States. Six health departments of States having these problems report that they actively engage in studies of hookworm infestation. Studies to determine the prevalence and distribution of malaria are made in 11 jurisdictions which have recognized the presence of this disease. The blood-smear method is more frequently used than the splenometric survey. Other features of the malaria programs are investigation of suspected anopheline breeding areas and participation in drainage and/or larvicidal projects for mosquito control. Twenty-five States make anopheline investigations, whereas sixteen participate in corrective measures. These are predominantly health department services, but occasionally agricultural experiment stations, boards of entomology, State universities or colleges, and independent departments of engineering cooperate. Free drugs for the treatment of hookworm and malaria are furnished by several States.

In the States where malaria is prevalent, measures for the control of pest mosquitoes are apt to be included in the general malaria program, or at least some collateral benefit in the way of pest-mosquito control is derived from the antimalaria measures employed. Only nine States list pest-mosquito control as a separate entity. This activity will be described more fully in subsequent articles devoted to sanitation.

Among the communicable diseases to which State health departments devote their attention, a few are transmissible from animal to man. Rabies, undulant fever, Rocky Mountain spotted fever, tularemia, and equine encephalomyelitis are several of these. Most States have some arrangement whereby, upon the reporting of such disease, the health department notifies the department of agriculture, domestic animals commission, or any other agency responsible for the health of livestock. A unified plan of control is then adopted. In some States this arrangement is reciprocal, the health department being notified by the other State agency if a condition potentially dangerous to man is discovered among animals.

By way of briefly summarizing the various State plans for communicable disease control it can be said: (1) That the health department is the State agency primarily responsible, but that as many as eight agencies of other types participate in the total State effort to reduce communicable illness rates; (2) that regulatory functions, promotional and educational work, and supervisory and consultatory activities are usually regarded as functions of the State agency; (3) that financial aid to local health units for communicable disease control usually is not designated as such, but is a part of the grant for general health work; (4) that extreme variation exists in the amount and kind of direct service rendered by the State agencies, this variation

no doubt being chiefly attributable to the difference in local programs which supplement those of the States.

TABLE 3.—*Bureau or division of each State health department in charge of communicable disease control in 1930 * and in 1940*

State or Territory	Bureau or division in charge in 1930	Bureau or division in charge in 1940
Alabama	Bureau of preventable diseases	Bureau of preventable diseases.
Arizona	Division of epidemiology	Division of local health administration.
Arkansas	Bureau of administration	Division of communicable disease control.
California	Division of preventable diseases	Bureau of epidemiology.
Colorado	Division of epidemiology	Division of local health administration and epidemiology.
Connecticut	Bureau of preventable diseases	Bureau of preventable diseases.
Delaware	Bureau of administration	Division of communicable diseases.
District of Columbia	Information not published	Division of preventable diseases.
Florida	Bureau of communicable diseases	Bureau of epidemiology.
Georgia	Division of administration	Division of preventable disease.
Idaho	Bureau of administration	Division of local health service.
Illinois	Division of communicable diseases	Division of communicable diseases.
Indiana	do	Bureau of communicable disease.
Iowa	Division of preventable diseases and epidemiology.	Division of preventable diseases.
Kansas	Division of communicable diseases	Division of epidemiology.
Kentucky	Bureau of epidemiology	Bureau of epidemiology.
Louisiana	do	Do.
Maine	Division of communicable diseases	Division of communicable diseases.
Maryland	Bureau of communicable diseases	Bureau of communicable diseases.
Massachusetts	Division of communicable diseases	Division of communicable diseases.
Michigan	Bureau of preventive medicine	Bureau of epidemiology.
Minnesota	Bureau of preventable diseases	Division of preventable disease.
Mississippi	Bureau of communicable diseases	Division of preventable disease control.
Missouri	Division for control of contagion	Division of local health administration.
Montana	Division of epidemiology	Division of epidemiology.
Nebraska	Division of venereal diseases and epidemiology.	Division of acute communicable diseases and venereal diseases.
Nevada	Central administration	Division of local health administration and epidemiology.
New Hampshire	Division of epidemiology and venereal disease control.	Division of epidemiology and local health work.
New Jersey	Bureau of local health administration	Bureau of local health administration.
New Mexico	Division of preventable diseases	Division of county health administration.
New York	Division of communicable diseases	Division of communicable diseases.
North Carolina	Bureau of epidemiology	Division of epidemiology and venereal disease control.
North Dakota	Bureau of preventable diseases	Division of preventable disease.
Ohio	Division of communicable diseases	Child hygiene division.
Oklahoma	Bureau of epidemiology	Division of epidemiology.
Oregon	Division of administration	Division of administration.
Pennsylvania	Bureau of communicable diseases	Division of epidemiology.
Rhode Island	Division of central administration	Division of preventable diseases.
South Carolina	Bureau of epidemiology	Division of communicable diseases.
South Dakota	Division of epidemiology	Division of epidemiology.
Tennessee	Division of preventable diseases	Division of preventable diseases.
Texas	Bureau of laboratories	Division of epidemiology.
Utah	Bureau of communicable diseases	Do.
Vermont	Division of communicable diseases	Division of communicable diseases.
Virginia	Bureau of epidemiology	Bureau of communicable diseases.
Washington	Division of communicable diseases	Division of epidemiology.
West Virginia	Division of preventable diseases	Division of communicable diseases.
Wisconsin	Bureau of communicable diseases	Bureau of communicable diseases.
Wyoming	Central administration	Division of epidemiology.
Alaska	Information not published	Division of communicable disease control.
Hawaii	do	Bureau of communicable diseases.
Puerto Rico	do	Bureau of epidemiology and vital statistics.
Virgin Islands	do	Health department not broken down into divisions or bureaus.

* See text footnote 3.

Since in all States major concern for the communicable disease situation rests with the health department, it is of interest to note the particular bureau or division of each department which is directly responsible. Of further interest is a study of the change in organization which has taken place during the past ten years. Table 3 shows

the division in charge in 1930 [10] and in 1940. There has been little net change from the standpoint of specialization in organization for the prevention of communicable disease. One-third of the States (information for 1930 was not published for the District of Columbia, the Territories, and the Virgin Islands) have made no change whatever during the ten-year interval in the division or bureau responsible. In some 20 additional States, the difference lies in terminology rather than function. True, 6 States which formerly carried on their communicable disease programs through the office of central administration now have separate communicable disease divisions, but, on the other hand, 5 States have added extra duties, notably local health administration, to the bureau which ten years ago operated exclusively for the control of communicable disease.

EXPENDITURES FOR COMMUNICABLE DISEASE CONTROL

Perhaps the most concrete expression of intensity of State service for communicable disease control is found in the amount of money expended for this purpose. However, extreme difficulty is encountered in arriving at an expenditure figure which is truly descriptive. Since communicable disease control is primarily a health department problem and only incidentally a problem of several other agencies of State government, it is not surprising to find that the health department is the sole agency which identifies its expenditures for communicable disease work. Indeed, complexity of organization and function, as well as variation in items included under similar terminology, make attempts to assign funds to specific services somewhat misleading even within health departments. Almost every plan for generalized health service has some bearing upon communicable disease control. For instance, all well-rounded public health nursing programs and all services of State health districts include some attention to the prevention or reduction of communicable illnesses; yet it is impossible to determine what portion of the cost of these general services should be charged to communicable disease control. Much of the work of the laboratory is concerned with the diagnosis of communicable disease but expenditures for such purposes are not as a rule separated from those devoted to support of general laboratory service. Likewise sanitation for the most part is directed toward reducing intestinal infections and infestations. Furthermore, in several States communicable disease activities are carried out in conjunction with the administrative functions of the health department or are so closely integrated with local health administration, with activities for control of the venereal diseases, or with the child health programs that separation of funds is impossible. Nevertheless, in spite of the many deficiencies in available data regarding expend-

[10] See footnote 3.

itures for State communicable disease work, they are presented as a partial answer to the numerous requests for such information.

The figures included in table 4 represent mere approximations, and even as such they must be accepted with certain reservations and qualifications. Expenditures of State health departments only are included, inasmuch as no other participating agencies of State government keep their records in such fashion as to permit segregation of communicable disease funds. Insofar as they could be separated, figures recorded in table 4 are exclusive of expenditures for tuberculosis, pneumonia, and venereal disease which are treated under other categories in this study. In a few States, however, no separation could be made. Footnotes to the table indicate these instances. Expenditures for laboratory services and for certain items of sanitation relating to communicable disease control are omitted, likewise, whenever possible. Costs of biologicals are included unless purchased by the division of central administration and lumped with general supplies of the department. Control activities for malaria and plague are included even though the control measures involved may be primarily a function of the engineering division. There is no separation, of course, of expenditures for communicable disease activities of the State district health officers or nurses who carry on generalized health programs. Briefly, expenditures included are restricted to those for communicable disease activities designated as such by the various State health departments. All funds disbursed by health departments for this purpose are recorded, irrespective of their source. Other than State-appropriated moneys, Federal grants—which amount to roughly 20 percent of the total—constitute the most sizable portion of State health department expenditures for communicable disease control.

According to table 4, State services specified as communicable disease control activities are costing the Nation almost 2 million dollars per year. This sum is the equivalent of $0.016 per capita. From the standpoint of individual jurisdictions, expenditures for designated State practices related to communicable disease control range from one-fifth of 1 cent to 30 cents per capita. At first glance it might be thought that explanation of this wide variation lies, at least partly, in the occasional inclusion of such nonseparable items as rural health administration, laboratory services, venereal disease activities, or vital statistics operations. Closer study reveals, however, that this impression cannot be confirmed except in one extreme instance, and even here these inseparable items are secondary to an active plague program.

TABLE 4.—*Approximate total and per capita annual expenditures * by State health departments for communicable disease activities designated as such ** in each State and Territory, the District of Columbia, and the Virgin Islands*

State or Territory	Approximate annual expenditure * for communicable disease activities designated as such **		State or Territory	Approximate annual expenditure * for communicable disease activities designated as such **	
	Total	Per capita		Total	Per capita
Total	$1,985,600	$0.016	Nevada	([a])	([a])
			New Hampshire	[b] $16,600	[b] $0.034
Alabama	50,000	.018	New Jersey	([a])	([a])
Arizona	([a])	([a])	New Mexico	6,900	.013
Arkansas	24,200	.012	New York	136,800	.010
California	52,600	.008	North Carolina	20,500	.003
Colorado	[b] 7,900	[b] .007	North Dakota	[c] 8,100	[c] .013
Connecticut	66,500	.039	Ohio	10,800	.002
Delaware	20,500	.077	Oklahoma	5,800	.002
District of Columbia	41,800	.066	Oregon	([a])	([a])
Florida	58,100	.031	Pennsylvania	41,000	.004
Georgia	72,000	.023	Rhode Island	[c] 26,100	[c] .037
Idaho	([a])	([a])	South Carolina	50,700	.027
Illinois	288,600	.037	South Dakota	7,600	.012
Indiana	32,600	.010	Tennessee	45,200	.016
Iowa	44,500	.018	Texas	29,800	.005
Kansas	6,000	.003	Utah	[c] 19,200	[c] .035
Kentucky	6,600	.002	Vermont	3,100	.009
Louisiana	106,800	.045	Virginia	30,300	.011
Maine	21,900	.026	Washington	10,500	.006
Maryland	[c] 29,300	[c] .016	West Virginia	8,200	.004
Massachusetts	104,600	.024	Wisconsin	11,400	.004
Michigan	27,700	.005	Wyoming	8,200	.033
Minnesota	[d] 114,600	[d] .041	Alaska	[c] 15,200	[c] .021
Mississippi	28,300	.013	Hawaii	[c, d] 126,800	[c, d] .300
Missouri	([a])	([a])	Puerto Rico	[e] 124,700	[e] .067
Montana	[b] 8,000	[b] .014	Virgin Islands	([a])	([a])
Nebraska	([a])	([a])			

* Expenditures for the health services considered represent index rather than absolute amounts. Because of variations in fiscal practices, figures cover the most recent year for which information was available at the date of interview. In some instances, because of overlapping and interweaving of activities, estimates were accepted in the absence of precise expenditure records. All funds disbursed by State health departments for communicable disease control are included, irrespective of their source. Other than State-appropriated moneys, Federal grants constitute the most sizable portion—roughly 20 percent of the total.

** Insofar as they could be separated, figures for communicable disease are exclusive of tuberculosis, pneumonia, and venereal disease, which are treated separately in this study. In a few States, however, no separation could be made. Expenditures for laboratory services are omitted, likewise, except in instances where records are kept in such fashion as to make segregation impossible. Costs of biologicals are included unless purchased by the division of central administration and lumped with general supplies of the department. Control work for malaria and plague are included even though the control measures involved are primarily a function of the engineering division. There is no separation, of course, of expenditures for communicable disease activities of the State district health officers or nurses who carry on generalized programs or for general sanitary measures in relation to communicable disease control.

[a] Information not available for communicable disease activities as such.
[b] Includes rural health administration.
[c] Includes venereal disease activities.
[d] Includes laboratory services.
[e] Includes vital statistics.

Several tests were made to determine whether any particular State characteristic appeared to be responsible for the differences found in per capita allotments for communicable disease work. The several criteria chosen for classification of the States in homogeneous groups were: Wealth, as measured by per capita income payments to individuals; [11] geographic area, as described by four major divisions

[11] Martin, John L., National Income Division, Department of Commerce: Income Payments to Individuals by States, 1929–39. Survey of Current Business, October 1940.

of the country previously established[12] for study of public health data; and total State population. For the first and third investigations the States were arrayed in descending order by per capita income and total population, respectively, and then were divided into quarters. For the second test, the geographic areas used were designated as Northeastern, Southern, Central, and Western.

Apparently the influence of State wealth is negligible until the highest quarter of States is reached. States of this group do spend appreciably more than those of the three lower per capita income brackets, for $0.013, $0.012, and $0.010, respectively, represent median per capita expenditures for State communicable disease activities in areas of the three lowest income levels arranged ascendingly, whereas the corresponding figure for the wealthiest quarter of States is $0.033. Nevertheless, it is doubtful whether differences in expenditures for communicable disease work could be attributed to a State's ability to pay, inasmuch as there is no continuous increase as the wealth level rises.

Location of a State within a particular geographic area appears to have very slight bearing upon the expenditure picture, likewise. Only in the Northeastern section is there noticeable difference from the remainder of the country in the per capita figure which represents allocation of funds to control of communicable disease at the State level. The median State of the Northeastern group reports $0.026 for this purpose; in the Southern section of the country the amount is $0.012; while in the Central area it is $0.011; and in the Western States, $0.013.

When total State population is used as the measure of variation, there is a different story, however. Here there is gradual increase in communicable disease expenditures as the total populations of the States drop. The median per capita expenditure for the middle 50 percent of the jurisdictions arrayed by total State population is twice as high as that for the most populous quarter of States, while the corresponding figure for the group of States representing the lowest quarter, as measured by total population, is more than three times as great as for the highest quarter. The median per capita expenditure for States of each population class is as follows: Highest

---

[12] Mountin, Joseph W., Pennell, Elliott H., and Pearson, Kay: The distribution of hospitals and their financial support in southern States. Southern Med. J., 33: 402 (April 1940). The established geographic areas with the States contained therein are as follows:

Northeastern: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia.

Southern: Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

Central: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.

Western: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

quarter, $0.008; second quarter, $0.016; third quarter, $0.016; and lowest quarter, $0.027.

The several variations cited, of course, may be an outgrowth of differences in complementary communicable disease programs conducted at the local level, examination of which was not included in the survey hereby reported. It is natural to assume that a greater portion of total service would be delegated to local subdivisions in the larger States than in the less populous ones; however, the exact influence of supplementary local service as a factor in determining State activity was not revealed by this study.

DISCUSSION

Activities at the State level for the control of communicable disease are largely concentrated within the health department. However, when the entire country is considered, eight other agencies of State government participate in some way in communicable disease control work. The department of health operates for this purpose in each of the 53 jurisdictions studied (the 48 States, District of Columbia, Territories of Alaska, Hawaii, and Puerto Rico, and the Virgin Islands making up the jurisdictions). In somewhat less than half of them it is the only State agency concerned with the communicable disease situation. In the other areas, departments of welfare, agriculture, or education, special commissions, State hospitals, universities, boards of entomology, or independent laboratories perform some function designed to lower communicable disease morbidity and mortality rates. In some instances there is close coordination between the health department activities and those of the other State agencies. On the other hand, there is sometimes complete independence or even duplication of effort.

Regulatory functions, which have long been regarded as the official responsibility of the State agency in communicable disease control, represent only one feature of current State communicable disease programs. Promotional and educational enterprises and supervisory and consultatory assistance in approved control methods are now engaged in by practically all State health departments. Financial grants-in-aid to local health units for general health work which includes activities for communicable disease control are another kind of State participation commonly employed. Direct service programs are characterized by great diversity among the several States. Types of direct service offered with varying frequency are as follows: Collection and analysis of morbidity reports, collection of reports of immunizations performed, management of surveys to determine illness incidence and extent of protection, performance of immunizations, provision of free biologicals and drugs for immunization against or treatment of

communicable illnesses, provision of clinical and/or laboratory diagnostic service, participation in epidemiological investigations, and provision of hospitalization for communicable disease patients. Because of the wide variation in practices, it would be utterly impracticable to describe a "typical" State program for communicable disease control. Presence or absence of direct State service is controlled, perhaps, in large measure by the amount and kind of local service available; yet the true extent of such influence was not determined in this survey.

Although it is impossible to arrive at an entirely complete and accurate figure for the cost of communicable disease services provided at the State level, the most satisfactory data available point to an approximate total annual expenditure of nearly 2 million dollars, or $0 015 per capita. This expenditure represents a wide range among the several States, those of large populations spending relatively less than those of small. It does not take into account the several health department functions of other designation that supplement direct measures for the control of communicable disease.

ORNITHODOROS TURICATA AND RELAPSING FEVER SPIROCHETES IN NEW MEXICO [1]

By Gordon E. Davis, *Senior Bacteriologist, United States Public Health Service*

In 1908, Banks reported the occurrence of the tick *Ornithodoros turicata* on cattle near Las Cruces, Dona Ana County, in southern New Mexico. In 1936, relapsing fever was contracted by a boy from California while visiting on a ranch in Chaves County, N. Mex. (not previously reported). The boy was accustomed to hunt rabbits, which are present in large numbers, and divide the rabbit meat among the hunting dogs. These are the only known reports for the State of relapsing fever or of a tick that is known to transmit it.

During the latter part of August 1940 the writer made a rapid survey of 10 counties, viz, Lea, Roosevelt, Curry, Chaves, Eddy, Lincoln, Dona Ana, Luna, Hidalgo, and Guadalupe, to determine whether ticks of the genus *Ornithodoros* were present. Forty lots, ranging from 1 to 78 ticks, were collected. During this period an additional lot of 16 ticks was collected in Chaves County by Assistant Entomologist Glen M. Kohls and Assistant Parasitologist William L. Jellison, of the Rocky Mountain Laboratory. The total number of ticks was 604, all *O. turicata.* Five hundred and thirty-nine survived shipment to the Rocky Mountain Laboratory, where they were tested for spirochetes.

---

[1] From the Rocky Mountain Laboratory, Hamilton, Mont, Division of Infectious Diseases, National Institute of Health.

In addition, casual observations were made in southwestern Quay County, the northern portion of Torrance County, and in an extensive prairie dog town in Santa Fe County, but no ticks were found.

TABLE 1.—*Ornithodoros turicata and relapsing fever spirochetes in New Mexico*

Accession No.	County	Date collected	Lot No.	Number of ticks		Host or other data	Collector	Spirochetes
				Collected	Tested			
17084	Lea	Aug. 13, 1940	1	11	11	Borrow pit	Davis	Not found.
17085	do	do	2	9	9	do	do	Do.
17086	do	do	3	8	8	do	do	Present.
17087	do	do	4	25	25	do	do	Do.
17088	do	Aug. 14, 1940	5	17	10	do	do	Not found.
17089	do	do	6	6	6	do	do	Do.
17090	do	do	7	34	20	do	do	Do.
17091	do	do	8	37	34	do	do	Do.
17092	Chaves	do	9	27	27	Kangaroo rat mound	do	Present.
17093	do	do	10	3	2	Under a rock	do	Not found.
17094	do	do	11	29	29	Kangaroo rat mound	do	Do.
17095	do	do	12	16	16	do	do	Present.
17103	do	Aug. 16, 1940	13	[1] 7	0	Small burrow	do	Do.
17107	do	Aug. 19, 1940	14	8	8	do	do	Do.
17108	do	do	15	16	15	do	do	Not found.
17109	do	do	16	9	7	do	do	Do.
17274	do	Aug. 21, 1940	17	16	16	do	Kohls and Jellison.	Present.
17096	Roosevelt	Aug. 15, 1940	18	2	1	Borrow pit	Davis	Not found.
17097	do	do	19	3	2	Prairie dog burrow	do	Do.
17098	do	do	20	3	3	Small burrow	do	Do.
17099	do	do	21	29	26	Borrow pit	do	Present.
17100	do	do	22	1	1	do	do	Not found.
17101	Curry	do	23	47	47	do	do	Do.
17102	do	do	24	14	14	do	do	Do.
17104	Eddy	Aug. 18, 1940	25	3	3	do	do	Do.
17105	do	do	26	4	2	Small burrow	do	Do.
17106	do	do	27	19	19	do	do	Do.
17110	Lincoln	Aug. 19, 1940	28	1	1	Kangaroo rat mound	do	Do.
17112	Otero	Aug. 20, 1940	29	14	11	Burrow	do	Do.
17113	do	do	30	14	14	do	do	Do.
17115	Hidalgo	Aug. 21, 1940	31	11	11	Kangaroo rat mound	do	Present.
17116	do	do	32	3	3	do	do	Not found.
17118	Guadalupe	Aug. 25, 1940	33	2	2	Borrow pit	do	Do.
17119	do	do	34	3	3	do	do	Do.
17120	do	do	35	41	40	do	do	Do.
17121	do	do	36	13	13	Kangaroo rat mound	do	Do.
17122	do	do	37	8	8	do	do	Do.
17123	do	do	38	7	4	do	do	Do.
17124	do	do	39	4	4	do	do	Do.
17125	do	do	40	78	53	Burrow	do	Do.
17126	do	do	41	2	2	do	do	Do.

[1] All ticks died.

Table 1 gives the laboratory accession number, the counties in which ticks were collected, the date of collection, the lot number, the number of ticks collected and number tested, the host or habitat, the collector, and the results of the test feedings. As ticks were collected from the habitats (burrows, etc.) rather than from the hosts, the latter cannot be definitely indicated.

Spirochetes were not recovered from 9 lots of ticks collected in Guadalupe County; 2 lots in Curry County; 3 lots in Eddy County; 1 lot in Lincoln County; and 2 lots in Otero County. In Lea County spirochetes were recovered from 2 of 8 lots, in Roosevelt County from 1 of 5 lots, in Chaves County from 4 of 9 lots, and in Hidalgo County

from 1 of 2 lots. The presence of spirochetes, as indicated, is based on one test feeding on white mice.

The accompanying map shows the general areas in which *O. turicata* has been collected and the tick lots from which spirochetes were recovered.

DISCUSSION

In this survey, as a rule, only main highways were traveled. It was determined early that "borrow pits" along the sides of the road were

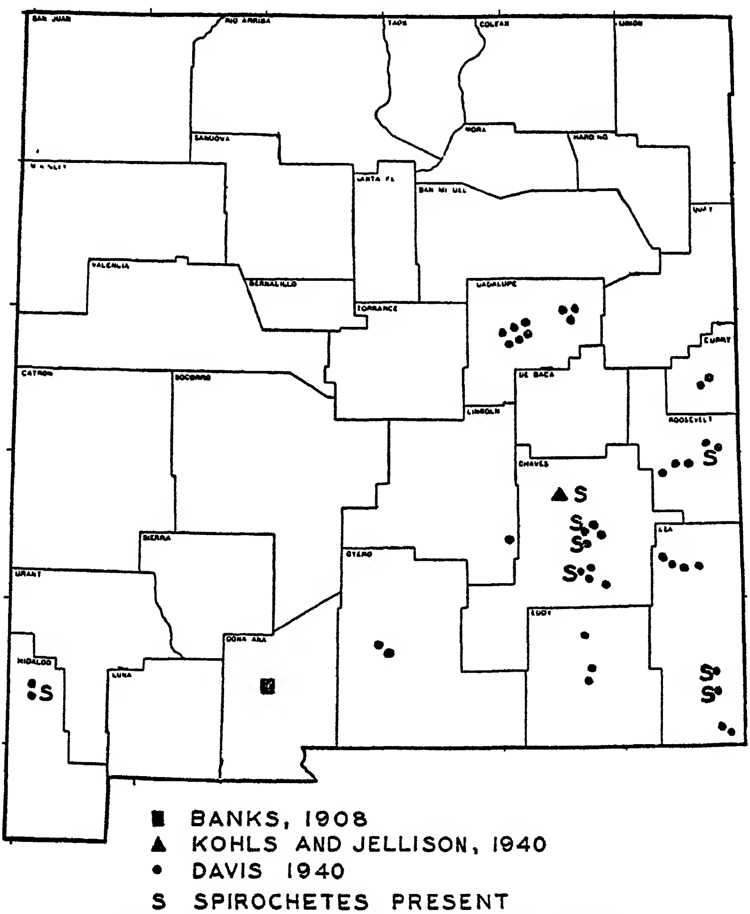


FIGURE 1.—*O. turicata* and relapsing fever spirochetes in New Mexico.

excellent indicators for the presence of ticks. The more easily excavated deposits of the caliche had been removed for road building, leaving the infiltrated calcareous material as mounds *in situ* or as banks bordering the pits. Under these mounds and banks were numerous burrows. The fecal pellets in and about the burrows

were evidence of the presence of several rodent species and birds. Most of the pellets were those of cottontail rabbits (*Sylvilagus* sp.). This type of habitat was encountered especially in Lea, Roosevelt, and Curry Counties along the eastern border of the State and in Guadalupe County.

Ticks were collected from a number of kangaroo rat mounds on the open mesa between Roswell and the mescalero ridge in Chaves County and in parts of Hidalgo and Guadalupe Counties. In Chaves County the rat species was *Dipodomys spectabilis baleyi*. The others were not determined. Although, except during the mating season, only one female rat, and later her young, are said to inhabit a mound, these mounds were extensive with spacious tunnels large enough for cottontail rabbits, and fecal pellets of this rodent were found in abundance. Burrows with as many as 14 openings were observed.

Three ticks were found in a prairie dog burrow and three beneath a rock.

It is generally agreed that cottontail rabbits do not make burrows of their own, but use any available hiding place. This consensus was substantiated by the different types of burrows which contained cottontail rabbit feces. Kangaroo rat mounds and prairie dog (*Cynomys* sp.) burrows have definite distinguishing characteristics. The small burrows noted were doubtless ground squirrel burrows but no ground squirrels were observed. From numerous records in the literature and our own observations, *O. turicata* seems quite cosmopolitan in host relations and has a marked anthropophilia.

Unfortunately, all ticks collected from the ranch on which the case of relapsing fever occurred died in transit to the laboratory. However, four positive lots were collected in the general area. A second case which appeared to be relapsing fever occurred in this county, but the attending physician made a diagnosis of tularemia with repeated relapses.

SUMMARY

In a rapid tick survey of 10 counties in southern and southeastern New Mexico, 41 lots with a total of 604 *Ornithodoros turicata* were collected. One entire lot died in transit to the laboratory; 539 ticks remained for testing. Eight lots representing 4 counties, Roosevelt, Chaves, Lea, and Hidalgo, were found to harbor relapsing fever spirochetes.

REFERENCE

Banks, Nathan: A revision of the Ixodoidea, or ticks, of the United States. Tech. Ser. No. 15, Bureau of Entomology, U. S. Department of Agriculture, 1908.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

October 5–November 1, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended November 1, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The reported number of cases of influenza rose from approximately 3,300 during the preceding 4 weeks to 5,009 for the 4 weeks ended November 1. The number represented an increase of more than 50 percent over the 1940 incidence, which figure (3,285 cases) also represents the median incidence for the corresponding period in the years 1936–40. The highest incidence is still confined to the West South Central region, with minor increases over the normal seasonal incidence in the South Atlantic, Mountain, and Pacific regions. Of the total number of cases reported, 2,192 occurred in Texas, 806 in South Carolina, 465 in West Virginia, and 248 in Arizona; three-fourths of the total cases were reported from those four States. The rate of increase for the country as a whole was slightly higher than during preceding years, due wholly to the high incidence in the States mentioned, as in other regions of the country the incidence was below normal, some regions not reporting the increase that normally occurs at this season of the year.

Poliomyelitis.—The number of cases of poliomyelitis declined further during the 4 weeks ended November 1—1,320 cases reported as compared with 2,239 for the preceding 4 weeks. The number of cases was only about 75 percent of last year's figure, but it was almost 50 percent above the 1936–40 median number of cases for this period. While the incidence has declined in all sections of the country, the States in which the disease has been most prevalent continued to report a relatively high incidence. The West North Central, West South Central, Mountain, and Pacific regions were apparently unaffected by the recent epidemic-like wave of this disease. With the exception of 1940 the current incidence of poliomyelitis was the highest since 1931 when approximately 1,800 cases were reported for this period.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period Oct. 5–Nov. 1, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period, 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	2,480	1,850	3,507	5,009	3,285	3,285	5,194	6,083	5,410
New England	18	27	40	7	4	7	725	851	456
Middle Atlantic	132	138	241	42	31	73	862	2,307	740
East North Central	238	194	483	187	224	234	702	1,631	612
West North Central	117	128	182	54	39	117	352	265	381
South Atlantic	1,038	610	1,305	1,499	1,144	1,144	885	191	412
East South Central	355	256	507	117	136	268	282	190	155
West South Central	449	338	355	2,482	1,127	871	218	82	90
Mountain	57	53	95	395	456	272	536	258	476
Pacific	76	106	136	226	121	124	632	258	258
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	117	106	168	1,320	1,789	902	7,318	7,928	9,939
New England	12	8	8	70	13	19	611	403	456
Middle Atlantic	23	9	30	432	92	92	1,078	1,265	1,635
East North Central	17	24	35	223	742	215	1,983	2,355	2,976
West North Central	9	11	12	83	403	170	792	903	1,312
South Atlantic	20	18	36	197	204	69	1,117	1,211	1,216
East South Central	15	19	28	105	58	58	750	663	663
West South Central	8	3	11	50	49	43	241	350	350
Mountain	1	7	7	17	63	40	257	232	396
Pacific	6	7	9	53	103	100	489	486	737
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	36	77	204	847	888	1,320	12,053	13,516	[3] 12,478
New England	0	0	0	24	25	25	926	1,011	1,041
Middle Atlantic	0	0	0	120	99	176	2,876	4,156	3,372
East North Central	13	36	36	95	109	186	3,931	3,656	3,656
West North Central	7	20	46	59	59	81	684	811	533
Souht Atlantic	0	0	1	225	190	221	1,194	1,250	1,130
East South Central	5	4	6	128	134	136	528	403	463
West South Central	7	9	9	119	164	271	387	583	332
Mountain	2	4	52	47	56	108	508	262	334
Pacific	2	4	19	30	52	67	1,039	1,294	714

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended November 1 there were 2,480 cases of diphtheria reported, as compared with 1,850, 3,219, and 4,262 cases for the corresponding period in 1940, 1939, and 1938, respectively. Significant excesses over last year were reported from the East North Central, South Atlantic, and South Central regions, but the West South Central region alone reported an excess over the 1936–40 average incidence for this period; the excess there amounted to about 20 percent. Compared with the 1936-40 median incidence, the number of cases in each region except the West South Central was relatively low.

Measles.—After maintaining a relatively high incidence for more than a year, the number of cases (5,174) of measles reported for the current period was only about 85 percent of the number reported for this period in 1940, and it was about 5 percent below the normal seasonal expectancy. While the median incidence for the country as a whole was slightly above the current number of cases, each region except the West North Central reported an increase of cases over the 1936–40 median incidence in the region, the greatest excesses occurring in the New England, South Atlantic, West South Central, and Pacific regions.

Meningococcus meningitis.—While the number of cases (117) of meningococcus meningitis was slightly higher than that recorded for the corresponding period in 1940, it was only about 70 percent of the average seasonal incidence (168 cases). Excesses over last year were reported from the North Atlantic, South Atlantic, and West South Central regions, but in all regions except the New England the incidence was below the average of preceding years.

Scarlet fever.—The incidence of scarlet fever was also relatively low, the number of cases (7,318) reported being the lowest on record for this period. Of the 9 geographic regions only 2, the New England and East South Central, reported an excess of cases over the average incidence for the corresponding period in the years 1936–40. For the country as a whole this disease has been on a decline since 1935; the number of cases occurring during the period in that year corresponding to the current one was approximately 15,700.

Smallpox.—The 36 cases of smallpox reported for the 4 weeks ended November 1 marked a new low level of this disease for this season of the year. The number was less than one-half of the number recorded in 1940 and less than 20 percent of the 1936–40 median incidence. The current incidence compares with approximately 1,700, 800, and 600 cases for the corresponding period in 1929, 1930, and 1931, respectively, and the average number of cases for this period in the years 1932–40 was approximately 230.

Typhoid fever.—Only a slight decline in the incidence of typhoid fever from last year's figure was reported for the current period, but the number of cases (847) was less than 60 percent of the normal seasonal incidence. In the New England and South Atlantic regions the incidence stood approximately at the expected seasonal level, but in all other regions the number of cases was relatively low.

Whooping cough.—This disease stood at about the normal seasonal level, the number of cases (12,053) reported for the current period being only about 400 below the 1938–40 median level. The incidence of whooping cough has been rather high during the current year, and for the first time this year the incidence for a 4-week period dropped below that for a corresponding period in 1940. All regions, however,

except the North Atlantic, reported more cases than might normally be expected, the greatest excesses being in the East North Central and Pacific regions.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended November 1, based on data received from the Bureau of the Census, was 10.7 per 1,000 inhabitants (annual basis), as compared with an average rate of 11.0 for the corresponding period in 1938–40.

DEATHS DURING WEEK ENDED NOVEMBER 8, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 8, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,159	7,984
Average for 3 prior years	7,678	
Total deaths, first 45 weeks of year	375,772	376,895
Deaths per 1,000 population, first 45 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	573	515
Average for 3 prior years	453	
Deaths under 1 year of age, first 45 weeks of year	23,807	22,585
Data from industrial insurance companies:		
Policies in force	64,617,631	64,863,128
Number of death claims	8,845	9,323
Death claims per 1,000 policies in force, annual rate	7.1	7.5
Death claims per 1,000 policies, first 45 weeks of year, annual rate	9.4	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 15, 1941

Summary

Of the 9 communicable diseases reported to the United States Public Health Service weekly by the State health officers and included in the following table, only influenza and poliomyelitis were above the 5-year (1936–40) median expectancy during the current week.

The incidence of poliomyelitis continued to decline, with 174 cases reported currently as compared with 191 cases for the preceding week and with the 5-year median of 161. The number of cases reported in Tennessee increased from 14 to 29, and slight increases were also recorded in Florida, Georgia, South Carolina, and North Carolina. The incidence declined in the Northern States. Only 2 States reported more than 12 cases—Tennessee and New York (the latter reported 28 cases, as compared with 39 last week). The total number of cases reported to date (first 46 weeks), 8,535, is below the numbers reported for the same period in 1940 (9,200) and in 1937 (9,187).

The number of reported cases of influenza increased slightly, from 2,308 to 2,372, of which Texas reported 1,085, South Carolina 276, Virginia 160, Oklahoma 141, and Arkansas 108.

Of 79 cases of endemic typhus fever, Georgia reported 35 and Texas 13. North Dakota reported 7 cases of infectious encephalitis during the week; California has reported 52 cases from August 3 to October 4.

A delayed report shows the occurrence of 1 case of psittacosis in San Bernardino County, Calif., during the week ended November 1.

The crude death rate for the current week for 88 large cities is 11.6 per 1,000 population, as compared with 11.4 for the preceding week and with 11.5 for the 3-year (1938–40) average for the corresponding week.

Telegraphic morbidity reports from State health officers for the week ended November 15, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 15 1941	Nov. 16 1940		Nov. 15 1941	Nov. 16 1940		Nov. 15 1941	Nov. 16 1940		Nov. 15 1941	Nov. 16 1940	
NEW ENG.												
Maine	0	1	2	-------	-------	1	92	200	28	1	0	0
New Hampshire	0	0	0	-------	-------	-------	3	4	4	0	0	0
Vermont	0	0	0	-------	-------	-------	3	9	9	0	0	0
Massachusetts	3	5	5	-------	-------	-------	101	219	177	8	3	2
Rhode Island	1	0	0	-------	-------	-------	6	2	2	0	0	0
Connecticut	0	0	1	-------	1	3	32	2	22	0	0	0
MID. ATL.												
New York [1]	8	17	24	[2] 5	[2] 11	[2] 11	124	357	149	3	2	3
New Jersey	7	12	13	10	-------	7	15	186	50	1	2	1
Pennsylvania	12	18	50	1	-------	-------	220	812	66	4	0	3
E. NO. CEN.												
Ohio	16	18	46	10	18	18	21	38	27	0	1	1
Indiana	27	11	21	52	4	4	17	22	18	1	0	0
Illinois	27	18	43	7	8	10	34	251	32	4	0	4
Michigan [3]	6	9	25	-------	11	1	117	368	78	0	3	1
Wisconsin	2	1	2	36	26	31	116	248	56	2	0	0
W. NO. CEN.												
Minnesota	1	4	7	-------	1	1	21	28	41	0	0	0
Iowa	4	7	4	2	1	1	18	41	17	0	0	0
Missouri	11	13	29	6	1	4	13	2	7	0	2	1
North Dakota	1	3	3	12	-------	4	57	4	4	0	0	0
South Dakota	0	1	1	-------	1	1	1	1	4	0	0	0
Nebraska	1	0	2	-------	-------	-------	2	2	2	0	0	0
Kansas	6	5	13	16	3	4	22	9	11	0	0	0
SO. ATL.												
Delaware	0	0	1	-------	-------	-------	0	0	0	0	0	0
Maryland [3]	17	2	14	9	1	5	40	6	6	0	0	0
Dist. of Col.	1	1	5	1	-------	-------	1	1	1	0	0	0
Virginia [1]	35	29	60	160	148	89	86	55	37	1	2	3
West Virginia	8	12	15	26	7	13	182	24	23	0	0	0
North Carolina [1]	63	49	117	9	3	5	98	24	103	1	0	2
South Carolina [1]	26	18	18	276	306	306	3	9	6	0	0	1
Georgia [1]	44	31	29	53	33	31	8	12	9	0	0	0
Florida [1]	4	11	11	-------	2	3	8	3	4	0	0	1
E. SO. CEN.												
Kentucky	11	11	25	1	10	15	2	73	12	1	0	5
Tennessee [1]	24	13	34	26	39	39	20	25	9	0	0	2
Alabama [1]	24	27	33	70	43	55	8	23	6	0	4	4
Mississippi [1]	18	23	18	-------	-------	-------	-------	-------	-------	2	0	0
W. SO. CEN.												
Arkansas [4]	36	12	21	108	24	28	32	2	3	0	0	1
Louisiana [1]	9	10	17	16	9	9	0	1	1	0	0	1
Oklahoma	22	29	29	141	23	34	23	2	4	0	0	0
Texas [1]	75	36	46	1,085	229	229	49	41	15	0	0	1
MOUNTAIN												
Montana	3	6	2	1	-------	-------	9	0	22	0	0	0
Idaho	1	0	0	-------	-------	-------	18	0	7	0	0	0
Wyoming [4]	2	1	0	6	-------	-------	2	3	4	0	0	0
Colorado	22	5	7	31	4	4	110	22	22	0	0	0
New Mexico	1	0	4	1	1	1	8	11	7	0	0	0
Arizona	6	5	5	96	56	58	40	39	3	0	0	0
Utah [3]	0	0	0	8	6	5	23	3	13	0	0	0
Nevada	0	0	-------	-------	-------	-------	1	0	-------	0	0	-------
PACIFIC												
Washington	0	6	2	2	-------	-------	2	6	15	0	0	0
Oregon	5	4	3	7	12	18	34	14	14	0	0	1
California [1]	12	18	34	82	138	33	349	27	47	1	0	1
Total	602	502	953	2,372	1,180	1,180	2,191	3,231	2,703	30	19	36
46 weeks	13,905	13,575	23,718	552,009	177,864	160,713	845,420	245,260	276,130	1,798	1,497	2,589

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 15, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 15, 1941	Nov. 16, 1940		Nov. 15, 1941	Nov. 16, 1940		Nov. 15, 1941	Nov. 16, 1940		Nov. 15, 1941	Nov. 16, 1940	
NEW ENG.												
Maine	0	0	0	15	8	8	0	0	0	0	0	1
New Hampshire	3	0	0	9	9	7	0	0	0	0	0	0
Vermont	0	0	0	2	2	4	0	0	0	0	0	0
Massachusetts	1	1	1	156	123	105	0	0	0	1	1	1
Rhode Island	1	0	0	8	2	5	0	0	0	0	1	1
Connecticut	0	0	0	32	15	38	0	0	0	2	0	2
MID. ATL.												
New York [1]	28	6	7	208	187	249	0	0	0	6	22	8
New Jersey	6	0	2	88	76	85	0	0	0	3	4	4
Pennsylvania	8	8	6	163	189	324	0	0	0	9	15	19
E. NO. CEN.												
Ohio	8	23	7	149	210	249	0	0	1	8	11	11
Indiana	6	9	1	86	73	150	0	0	1	3	1	1
Illinois	12	21	5	168	250	287	0	8	2	2	2	13
Michigan [3]	5	21	5	178	156	287	0	3	4	1	3	4
Wisconsin	4	11	1	113	110	123	0	1	2	0	3	1
W. NO. CEN.												
Minnesota	2	11	2	46	64	101	1	2	4	0	1	1
Iowa	1	6	4	43	62	67	1	1	6	1	0	2
Missouri	0	3	3	62	62	103	1	0	2	2	1	5
North Dakota	2	0	0	16	8	35	0	1	10	0	1	1
South Dakota	0	0	0	13	13	34	0	0	2	0	0	1
Nebraska	0	2	2	13	17	25	0	0	0	6	0	1
Kansas	1	7	2	85	53	91	0	0	1	0	4	3
SO. ATL.												
Delaware	1	0	0	12	7	9	0	0	0	0	0	1
Maryland [3]	2	1	1	50	32	45	0	0	0	4	0	5
Dist. of Col.	2	0	0	17	10	10	0	0	0	0	1	1
Virginia [1]	7	12	1	79	86	54	1	0	0	9	10	7
West Virginia	1	19	0	67	49	81	0	0	0	5	3	7
North Carolina [1]	5	2	1	83	89	89	0	0	0	3	2	2
South Carolina [1]	3	0	1	14	23	13	0	0	0	3	0	2
Georgia [1]	4	1	1	63	43	38	1	0	0	8	9	10
Florida [1]	4	1	1	4	2	2	0	0	0	2	8	3
E. SO. CEN.												
Kentucky	3	3	3	54	48	69	0	0	0	15	13	12
Tennessee [1]	29	4	1	122	117	71	1	10	1	4	8	5
Alabama [1]	4	0	1	63	42	31	0	0	0	4	7	5
Mississippi [1]	3	2	2	12	15	15	0	0	0	3	4	3
W. SO. CEN.												
Arkansas [4]	3	0	2	7	13	20	0	1	1	4	7	10
Louisiana [1]	1	3	1	2	10	17	0	0	0	11	3	7
Oklahoma	1	3	1	20	29	29	0	1	2	1	5	9
Texas [1]	2	3	3	75	45	51	0	5	1	7	9	14
MOUNTAIN												
Montana	1	0	0	29	10	32	0	0	2	0	0	2
Idaho	0	2	1	6	7	13	0	0	1	0	0	2
Wyoming [4]	1	6	0	9	8	8	0	0	1	3	0	0
Colorado	0	1	1	29	24	32	0	0	1	1	2	1
New Mexico	0	0	0	6	5	14	0	0	0	1	3	5
Arizona	1	0	0	6	6	6	0	1	0	0	0	1
Utah [3]	1	2	1	8	24	15	0	0	0	0	2	1
Nevada	0	0	------	1	0	------	0	0	------	0	0	------
PACIFIC												
Washington	0	7	1	20	30	39	0	0	1	0	1	1
Oregon	5	3	1	6	11	24	0	10	8	0	3	3
California [1]	2	1	8	134	99	180	2	0	1	4	6	6
Total	174	205	161	2,651	2,568	3,613	8	44	61	136	176	242
46 weeks	8,535	9,200	6,793	109,986	138,396	164,148	1,264	2,176	9,062	7,828	8,911	13,346

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 15, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough	
	Week ended	
	Nov. 15, 1941	Nov. 16, 1940
NEW ENG.		
Maine	43	18
New Hampshire	44	0
Vermont	9	8
Massachusetts	158	165
Rhode Island	12	2
Connecticut	54	80
MID. ATL.		
New York [1]	466	465
New Jersey	224	188
Pennsylvania	----------	736
E. NO. CEN.		
Ohio	173	420
Indiana	39	20
Illinois	202	134
Michigan [3]	304	433
Wisconsin	244	188
W. NO. CEN.		
Minnesota	52	52
Iowa	15	21
Missouri	32	48
North Dakota	13	19
South Dakota	6	2
Nebraska	0	21
Kansas	79	49
SO. ATL.		
Delaware	9	46
Maryland [3]	28	83
Dist. of Col	21	3
Virginia [1]	101	91
West Virginia	60	15
North Carolina [1]	127	107
SO. ATL.—continued		
South Carolina [1]	32	39
Georgia [1]	21	10
Florida [1]	6	7
E. SO. CEN.		
Kentucky	52	68
Tennessee [1]	22	82
Alabama [1]	9	3
Mississippi [1]	----------	----------
W. SO. CEN.		
Arkansas [4]	11	11
Louisiana [1]	2	4
Oklahoma	23	10
Texas [1]	71	89
MOUNTAIN		
Montana	35	1
Idaho	5	6
Wyoming [4]	2	0
Colorado	81	38
New Mexico	20	9
Arizona	3	10
Utah [3]	29	25
Nevada	64	0
PACIFIC		
Washington	111	57
Oregon	18	24
California [1]	164	285
Total	3,296	4,192
46 weeks	187,618	146,871

[1] Typhus fever, week ended Nov. 15, 1941, 79 cases as follows: New York, 1; Virginia, 1; North Carolina, 2; South Carolina, 2; Georgia, 35; Florida, 3; Tennessee, 2; Alabama, 8; Mississippi, 6; Louisiana, 5; Texas, 13; California, 1.
[2] New York City only.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended Nov. 15, 1941, 3 cases, as follows: Arkansas, 1; Wyoming, 2

WEEKLY REPORTS FROM CITIES

City reports for week ended November 1, 1941

This table lists the reports from 134 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Maine:											
Portland	0	------	0	0	2	8	0	1	1	1	21
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	13
Manchester	0	------	0	0	2	9	0	0	0	0	21
Nashua	0	------	0	0	0	0	0	0	0	7	10
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	1	0	0	0	0	0	5	9
Rutland	0	------	0	0	1	0	0	0	0	0	9
Massachusetts:											
Boston	0	------	0	5	10	27	0	2	0	40	169
Fall River	2	------	0	0	0	11	0	0	0	0	29
Springfield	0	------	0	7	0	5	0	0	0	8	23
Worcester	0	------	0	0	5	9	0	1	0	12	49
Rhode Island:											
Pawtucket	0	------	------	1	------	1	0	------	0	0	------
Providence	1	------	0	8	4	3	0	1	0	28	53
Connecticut:											
Bridgeport	0	------	0	0	1	0	0	1	0	0	26
Hartford	0	------	0	0	5	3	0	1	0	4	52
New Haven	0	------	0	10	2	2	0	1	0	8	33
New York:											
Buffalo	0	------	1	1	8	14	0	5	0	5	153
New York	16	1	0	20	61	63	0	42	3	244	1,366
Rochester	1	------	0	0	2	1	0	1	0	2	72
Syracuse	1	------	0	0	1	0	0	0	0	18	37
New Jersey:											
Camden	0	------	0	0	3	4	0	1	0	5	31
Newark	0	2	0	0	5	15	0	1	1	51	84
Trenton	0	------	0	0	4	6	0	0	0	8	40
Pennsylvania:											
Philadelphia	2	1	1	2	17	25	0	20	2	35	440
Pittsburgh	5	1	2	1	6	17	0	11	1	34	145
Reading	0	------	0	2	0	0	0	0	0	1	15
Scranton	0	------	------	3	------	2	0	------	0	4	------
Ohio:											
Cincinnati	1	1	0	2	1	51	0	2	0	73	104
Cleveland	1	3	0	3	12	21	0	6	1	44	176
Columbus	0	1	1	2	3	7	0	4	0	7	97
Toledo	0	1	1	0	2	5	0	1	0	19	63
Indiana:											
Anderson	0	------	0	0	0	0	0	0	0	0	9
Fort Wayne	1	------	0	1	3	0	0	1	0	0	33
Indianapolis	3	------	0	0	5	12	0	4	0	12	104
Muncie	0	------	0	0	0	0	0	0	0	0	13
South Bend	0	------	0	0	0	0	0	0	0	0	22
Terre Haute	0	------	0	0	1	0	0	1	0	0	32
Illinois:											
Alton	0	------	0	0	1	0	0	0	0	0	7
Chicago	12	4	1	12	19	59	0	22	0	95	707
Elgin	0	2	0	0	0	0	0	0	0	5	6
Springfield	0	------	0	0	2	3	0	0	0	0	17
Michigan:											
Detroit	0	1	1	3	10	51	0	20	0	53	240
Flint	0	------	0	0	2	1	0	0	0	2	22
Wisconsin:											
Kenosha	0	------	0	0	0	3	0	0	0	3	7
Madison	0	------	0	0	0	2	0	0	0	5	10
Milwaukee	1	1	1	4	5	4	0	2	0	93	95
Racine	0	------	0	1	0	11	0	0	0	14	18
Superior	0	------	0	0	0	0	0	0	0	0	5
Minnesota:											
Duluth	0	------	0	0	1	2	0	0	0	4	18
Minneapolis	0	------	1	4	2	12	0	0	0	21	88
St. Paul	0	------	0	2	4	2	0	0	0	18	61
Iowa:											
Cedar Rapids	0	------	------	0	------	2	0	------	0	0	------
Davenport	2	------	------	0	------	1	0	------	0	0	------
Des Moines	1	------	0	1	0	2	0	0	0	1	35
Sioux City	1	------	------	0	------	0	0	------	0	0	------
Waterloo	1	------	------	0	------	2	0	------	0	0	------

City reports for week ended November 1, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0	------	1	1	3	20	0	3	0	3	92
St. Joseph	1	------	0	1	4	3	0	0	0	0	23
St. Louis	0	------	0	1	9	18	0	4	1	4	234
North Dakota:											
Fargo	0	------	0	0	1	1	0	0	0	0	20
Grand Forks	0	------	------	0	------	1	0	------	0	0	------
Minot	0	------	0	4	0	0	0	0	0	0	6
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	2	------
Sioux Falls	0	------	0	0	0	1	0	0	0	0	12
Nebraska:											
Lincoln	1	------	------	1	------	0	0	------	0	0	------
Omaha	0	------	0	2	4	0	0	1	0	0	44
Kansas:											
Lawrence	0	1	0	0	0	0	0	0	0	0	9
Topeka	0	------	0	1	0	2	0	0	0	6	8
Wichita	0	------	0	2	1	1	0	0	0	2	28
Delaware:											
Wilmington	1	------	0	0	1	4	0	0	0	1	23
Maryland:											
Baltimore	0	4	0	13	7	14	0	10	2	30	196
Cumberland	0	------	0	0	0	0	0	0	1	0	11
Frederick	0	------	0	0	1	0	0	0	0	0	4
Dist. of Col.:											
Washington	4	1	1	0	8	12	0	9	0	24	185
Virginia:											
Lynchburg	0	------	0	0	0	0	0	0	0	0	9
Norfolk	5	------	0	0	1	2	0	2	3	1	29
Richmond	3	------	1	0	3	3	0	2	0	0	53
Roanoke	0	------	0	0	0	1	0	0	0	1	14
West Virginia:											
Charleston	0	------	0	0	0	2	0	0	1	5	12
Huntington	3	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	4	1	4	0	1	0	0	12
North Carolina:											
Gastonia	4	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	0	0	0	0	0	1	2	16
Wilmington	0	------	0	1	2	0	0	1	0	1	17
Winston-Salem	3	------	0	17	0	1	0	0	0	0	15
South Carolina:											
Charleston	0	8	0	1	1	0	0	0	4	0	14
Florence	0	------	0	0	1	2	0	1	0	0	7
Greenville	1	------	0	0	0	0	0	0	0	0	14
Georgia:											
Atlanta	0	8	1	0	4	4	0	6	1	1	76
Brunswick	0	------	0	0	1	0	0	0	0	0	2
Savannah	1	------	0	0	2	2	0	0	0	0	33
Florida:											
Miami	0	------	0	1	1	0	0	1	0	2	39
St. Petersburg	0	------	0	0	1	1	0	0	0	3	17
Tampa	2	------	0	0	1	1	0	1	0	1	33
Kentucky:											
Ashland	0	------	0	0	0	0	0	1	1	2	4
Covington	0	------	0	0	0	3	0	3	0	0	11
Lexington	0	------	0	0	0	0	0	0	0	4	14
Louisville	0	1	0	0	2	20	0	1	1	36	74
Tennessee:											
Knoxville	2	------	1	0	0	3	0	1	0	0	29
Memphis	1	------	0	0	1	1	0	2	2	1	70
Nashville	2	------	2	1	2	4	0	4	0	15	35
Alabama:											
Birmingham	0	1	0	0	4	4	0	3	1	1	71
Mobile	1	------	0	0	1	0	0	1	0	0	14
Montgomery	0	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	1	0	------	0	0	------
Little Rock	0	1	0	1	2	0	0	1	0	2	32
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	1
New Orleans	1	5	0	0	4	1	0	2	2	6	94
Shreveport	1	------	0	0	3	0	0	1	0	0	43
Oklahoma:											
Oklahoma City	0	8	0	0	2	4	0	0	0	0	44
Tulsa	1	------	0	6	1	1	0	2	0	0	19

City reports for week ended November 1, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Texas:											
Dallas	8	1	1	5	3	5	0	0	1	8	48
Fort Worth	6		0	0	2	1	0	0	0	0	36
Galveston	0		0	0	0	0	0	1	0	0	11
Houston	2		0	0	5	1	0	6	0	3	91
San Antonio	0	4	3	1	5	4	0	6	0	0	81
Montana:											
Billings	0		0	0	1	1	0	0	0	0	10
Great Falls	0		0	7	1	3	0	0	0	3	7
Helena	0		0	0	0	0	0	0	0	0	2
Missoula	0	1	0	0	0	0	0	0	0	0	12
Colorado:											
Colorado Springs	0		0	0	0	3	0	1	0	0	9
Denver	2	9	0	5	4	3	0	0	0	24	86
Pueblo	0		0	20	1	1	0	0	0	0	15
New Mexico:											
Albuquerque	0		0	0	0	0	0	1	0	0	7
Arizona:											
Phoenix	0	16		1		0	0		0	4	
Utah:											
Salt Lake City	0		0	3	2	0	0	0	0	9	26
Washington:											
Seattle	0		1	0	4	2	0	2	0	19	98
Spokane	0		0	0	2	6	0	0	0	12	32
Tacoma	0		0	0	0	2	0	1	0	4	28
Oregon:											
Portland	0	4	0	1	0	2	0	0	0	3	90
Salem	0			0		0			0	0	
California:											
Los Angeles	3	17	0	22	3	0	0	13	0	23	341
Sacramento	1		0	0	3	1	0	0	0	0	33
San Francisco	0	3	0	3	5	6	0	3	1	15	172

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	0	0	3
New York:			
Buffalo	0	0	1
New York	1	0	23
Rochester	0	0	4
Syracuse	0	0	4
New Jersey:			
Newark	0	0	2
Pennsylvania:			
Philadelphia	0	0	5
Pittsburgh	1	0	1
Ohio:			
Cincinnati	1	0	4
Cleveland	0	0	3
Columbus	0	0	1
Toledo	0	0	2
Illinois:			
Chicago	0	0	4
Michigan:			
Detroit	0	0	3
Minnesota:			
Duluth	0	0	2
Minneapolis	0	0	2
Missouri:			
St. Joseph	1	0	0
St. Louis	0	0	1
Delaware:			
Wilmington	0	0	4
Maryland:			
Baltimore	0	0	1
District of Columbia:			
Washington	0	0	2
Virginia:			
Lynchburg	0	0	1
Norfolk	0	0	1
South Carolina:			
Charleston	0	0	1
Georgia:			
Atlanta	0	0	1
Tennessee:			
Nashville	0	0	8
Alabama:			
Birmingham	0	0	4
Mobile	0	0	1
Utah:			
Salt Lake City	0	0	1
Washington:			
Seattle	1	0	0
Oregon:			
Portland	0	0	1
California:			
Los Angeles	0	0	1

Dengue.—Cases: Charleston, S. C., 2.

Encephalitis, epidemic or lethargic.—Cases: Nashua, 1; New York, 1; Minneapolis, 2; Sacramento, 1. Deaths: New York, 1; Birmingham, 1.

Pellagra.—Cases: Savannah, 2; Miami, 1; Birmingham, 2; Phoenix, 5.

Typhus fever.—Cases: Winston-Salem, 1; Atlanta, 5; Savannah, 2; Tampa, 1; New Orleans, 5.

Rates (annual basis) per 100,000 population for a group of 88 selected cities (population, 1940, 33,738,690)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Nov. 1, 1941	12.98	12.21	3.09	31.22	48.84	91.03	0.00	36.32	4.17	180.67
Average for week, 1936–40	23.74	13.12	4.37	81.85	61.98	109.81	.62	49.36	5.78	159.33

TERRITORIES AND POSSESSIONS

VIRGIN ISLANDS OF THE UNITED STATES

Notifiable diseases—July–September 1941.—During the months of July, August, and September 1941, cases of certain notifiable diseases were reported in the Virgin Islands as follows:

Disease	July	August	September	Disease	July	August	September
Chickenpox			15	Malaria	2	4	
Dengue	31	17	2	Pellagra		1	
Filariasis	6	8	6	Pneumonia (all forms)		4	1
Gonorrhea	15	31	21	Syphilis	29	35	34
Hookworm disease	4	2	6	Tuberculosis	2	1	1

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended October 11, 1941.—During the week ended October 11, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1	1	2	7	1		1	3	16
Chickenpox		28		56	99	58	35		51	327
Diphtheria		15	1	21	3	3	22		1	66
Dysentery				35	12					47
Influenza		10				2			20	32
Lethargic encephalitis					1	1	[1] 18			20
Measles				253	9		4	4	6	276
Mumps		1		124	58	18	17	2	11	231
Pneumonia		1			3		1		2	7
Poliomyelitis			12	3	7	13	3		3	41
Scarlet fever		17	4	98	116	11	3	13	13	275
Smallpox							1			1
Tuberculosis	2	4	14	93	43	42		1		199
Typhoid and paratyphoid fever		1		39	6		3	3		52
Whooping cough			3	131	99	1	12	2	9	257

[1] Encephalomyelitis.

CUBA

Provinces—Notifiable diseases—4 weeks ended October 11, 1941.—During the 4 weeks ended October 11, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	2	1	1	9	1	9	23
Chickenpox		2				11	13
Diphtheria	1	13	10	1		3	28
Hookworm disease				3			3
Leprosy	2	13				2	17
Malaria	64	9	1	36	2	45	157
Measles		15	4	1			20
Poliomyelitis		1					1
Scarlet fever		1					1
Trachoma				1			1
Tuberculosis	15	78	17	50	7	35	202
Typhoid fever	13	44	13	55	14	27	166
Whooping cough	1					1	2

[1] Includes the city of Habana.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

British East Africa—Uganda.—According to a report dated September 9, 1941, 1 case of yellow fever occurred in the western part of Uganda, British East Africa. All precautionary measures have been taken.

Sudan (French)—Kindia.—On October 31, 1941, 3 fatal cases of yellow fever were reported in Kindia, French Sudan.

COURT DECISION ON PUBLIC HEALTH

Operation of city sewage disposal plant not enjoined.—(Texas Court of Civil Appeals; *Mitchell et al.* v. *City of Temple et al.*, 152 S.W.2d 1116; decided June 11, 1941, rehearing denied July 2, 1941.) A suit was brought against the city of Temple and certain of its officers to abate, by injunction, and as a nuisance, the operation of the city's sewage disposal plant. The suit was for injunction only and not for damages. It was alleged that the plant and the sewer pipe leading from the city into it constituted a nuisance in that (1) obnoxious and repulsive odors, permitted to escape from the plant, came into the houses of the plaintiffs, and (2) because of leaks in joints of the sewer line, sewage was permitted to escape therefrom and to seep into the wells of some of the plaintiffs, thus rendering the water unfit for use, and, in addition, to seep into the nearby ravines and cause the breeding and collection of mosquitoes and flies and obnoxious odors.

The trial court denied a temporary injunction and, on appeal to the court of civil appeals, the plaintiffs in the main contended that, under the evidence adduced by them, they were entitled to the injunction prayed for to abate such nuisance as a matter of law.

The appellate court said that the granting of a temporary injunction was vested largely in the discretion of the trial court and that in the instant case the evidence was conflicting both as to the nature and extent of the odors from the plant and as to whether or not whatever leakage or seepage there might originally have been at the joints in the sewer line had been corrected and no longer existed. It was stated to be now well settled that, on the issue of a temporary injunction in such cases, the trial court was entitled to take into consideration the question of comparative injury or "balancing of the equities"

and that, if granting the injunctive relief would work a greater hardship and injury upon the public than would result to the plaintiff by denying the relief, the court was clearly authorized to deny it. "The general rule", said the court, "seems to be that if public necessity, public health and convenience outweigh any resulting private injury, or if granting the writ will cause great harm to the public, the writ will be refused." In affirming the judgment of the trial court the appellate court said that, even if the testimony of the plaintiffs were taken as true and without contradiction, it was manifest that a much greater injury would be inflicted upon the people of the city of Temple, shown to have a population of 15,000, by completely enjoining the operation of its sewage disposal plant than would result to the plaintiffs from a refusal to enjoin the plant's operation. "They [the plaintiffs] undoubtedly have an adequate remedy at law by way of damages."

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world, (2) articles relating to the cause, prevention, and control of disease, (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 NOVEMBER 28, 1941 NUMBER 48

IN THIS ISSUE

Disease Outbreaks From Water, Milk, and Other Foods

Tumors Diagnosed at the National Institute of Health

U.S. PUBLIC HEALTH SERVICE 1798

CONTENTS

Public Health Reports

Vol. 56 • NOVEMBER 28, 1941 • *No. 48*

DISEASE OUTBREAKS FROM WATER, MILK, AND OTHER FOODS IN 1939[1]

By A. W. FUCHS, *Senior Sanitary Engineer, United States Public Health Service*

Since 1923 the United States Public Health Service has collected reports annually from State and local health departments on milk-borne outbreaks of disease. Summaries of these outbreaks have been compiled and issued in mimeographed form each year. Prior to that time our knowledge of milk-borne disease outbreaks was limited to those which had found their way into the literature. As a result of these annual surveys the number of milk-borne outbreaks coming to our attention has increased from an average of 17 per year prior to 1923 to an average of 42 per year since that date.

In the interest of more complete knowledge of disease outbreaks conveyed through vehicles other than milk and milk products, 2 years ago the Public Health Service inaugurated the first Nation-wide survey of outbreaks of disease caused by faulty sanitation in general. Mimeographed reports have been issued for 1938 and for 1939, containing summaries of each outbreak reported from water supplies, milk and milk products, other foods, and unidentified vehicles. A discussion of the outbreaks occurring during 1938 has been published.[2] The present discussion gives a summary and analysis of the outbreaks reported for 1939.

Table 1 lists the total outbreaks, cases, and deaths, according to vehicle, for 1939; data for 1938 are given for purposes of comparison.

The most striking fact is that other foods were a far more prolific source of outbreaks than were milk or water. This is particularly true for 1939, when other foods were responsible for nearly 60 percent of all outbreaks reported, as compared to approximately 40 percent for 1938. The increase for 1939 may represent better reporting rather than an actual rise. In 1939, outbreaks from other foods likewise involved more cases and more deaths than did those due to water or

[1] From the States Relations Division. Read before the Central Atlantic States Association of Dairy, Food, and Drug Officials, Atlantic City, May 16, 1941.

[2] Frank, Leslie C.: Disease outbreaks resulting from faulty environmental sanitation. Pub. Health Rep., 55: 1373 (Aug. 2, 1940) (Reprint No. 2185).

milk. The excess of total cases in 1938 over 1939 was the result of a single water-borne outbreak of gastroenteritis, involving 29,250 cases, which occurred in one large city.

TABLE 1.—*Total outbreaks, cases, and deaths, by vehicles, 1939 and 1938*

Vehicle	1939			1938		
	Outbreaks	Cases	Deaths	Outbreaks	Cases	Deaths
Water supplies	43	2,254	3	48	31,693	17
Milk and milk products	41	2,509	7	42	1,685	27
Other foods	148	3,782	12	70	2,247	25
Unidentified vehicles	17	1,203	6	8	882	3
Total	249	9,748	28	168	36,507	72

The largest outbreak reported for 1939 was one of bacillary dysentery occurring in a State institution in the town of Marcy, N. Y., in which 609 of the 2,321 patients exposed were affected through either milk or food prepared by three carriers. This outbreak is listed under unidentified vehicles. The largest outbreak from milk and milk products was one of septic sore throat at Catskill and Saugerties, N. Y., involving 546 customers of a raw-milk dealer handling 10 percent of the total suply. The infection was traced to a cow with acute mastitis from which hemolytic streptococci of the human type were isolated. The largest outbreak from water supplies occurred at Minneapolis. Approximately 400 cases of gastroenteritis and 2 cases of typhoid fever were reported among employees of office buildings using water from drilled basement wells which were found to be contaminated by sewage. The largest outbreak from other foods was one of gastroenteritis in Monroe County, N. Y., in which 320 of the 400 guests at a university banquet were affected. Neither the identity of the food nor the manner of contamination could be ascertained.

WATER-BORNE OUTBREAKS

Table 2 shows that unsafe water supplies caused far more outbreaks and cases of gastroenteritis than of either typhoid fever or dysentery. Incidentally, in 1939 there were more outbreaks of typhoid fever from water supplies than from milk and other foods combined, but this was not the case in 1938.

From table 3 it is seen that ground water supplies were incriminated in 31 of the 35 water-borne outbreaks for which the type of water supply was reported. In nearly all cases the wells and springs were contaminated by sewage or surface drainage. One of the important problems still remaining in connection with the prevention of water-borne disease is the sanitary control of ground water supplies.

TABLE 2.—*Outbreaks, cases, and deaths, 1939, by diseases and by vehicles*

Disease	Water supplies			Milk and milk products			Other foods			Unidentified vehicles			All vehicles		
	Outbreaks	Cases	Deaths	Outbreaks	Cases	Deaths	Outbreaks	Cases	Deaths	Outbreaks	Cases	Deaths	Outbreaks	Cases	Deaths
Botulism							9	16	7				9	16	7
Dysentery	3	265	0	2	324	0	2	99	0	5	916	4	12	1,604	4
Food poisoning				12	179	0	88	1,347	2				100	1,526	2
Gastroenteritis (including diarrhea)	27	1,892	0	7	570	0	35	1,880	0	5	246	0	74	4,588	0
Paratyphoid fever				2	24	0	2	247	1				4	271	1
Scarlet fever				3	42	1	1	27	0				4	69	1
Septic sore throat				6	1,282	5							6	1,282	5
Trichinosis							4	30	0				4	30	0
Typhoid fever	13	97	3	6	51	1	5	99	1	7	41	2	31	288	7
Undulant fever				1	4	0							1	4	0
Not stated				2	33	0	2	37	1				4	70	1
Total	43	2,254	3	41	2,509	7	148	3,782	12	17	1,203	6	249	9,748	28

TABLE 3.—*Water-borne outbreaks, 1939, by type of supply*

Type of water supply	Number of outbreaks	Number of cases	Number of deaths
Ground water supplies:			
Treated	2	80	0
Untreated	24	1,303	2
Treatment not stated	5	90	1
Surface water supplies.			
Treated	0	0	0
Untreated	3	38	0
Treatment not stated	1	10	0
Source not stated:			
Treated	4	337	0
Untreated	0	0	0
Treatment not stated [1]	4	396	0
Total	43	2,254	3

[1] 1 outbreak included in this group, involving 325 cases of gastroenteritis, was attributed to ice.

Table 4 shows water-borne outbreaks by size of community. It will be noted that 8 outbreaks occurred in cities of more than 10,000 population, as compared with 30 in communities under 10,000. While the number of communities under 10,000 population is many times greater than the number over 10,000, their total populations are approximately equal. It is obvious, therefore, that smaller communities had fewer water-borne outbreaks in proportion to their number than the larger cities. On the other hand, the number of persons affected was greater in proportion to population.

Table 5 shows the States in which the water-borne outbreaks occurred. Two-thirds of the States failed to report any water-borne outbreaks for 1939, whereas nearly one-half of all the outbreaks were reported by a single State. Comment on this interesting fact will be made later.

TABLE 4.—*Outbreaks and cases, 1939, by size of community and by vehicles*

Population of community	Water supplies		Milk and milk products		Other foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
1-99	1	2	1	5	1	4
100-499	5	151	1	9	4	185
500-999	2	63	1	70	4	146
1,000-2,499	7	522	4	125	9	506
2,500-4,999	7	246	8	724	6	441
5,000-9,999	8	307	5	392	9	351
Under 10,000	30	1,291	20	1,325	33	1,633
10,000-24,999	3	181	8	895	14	392
25,000-99,999	1	3	6	226	19	130
100,000-499,999	3	727	2	38	27	199
500,000 and over	1	15	4	17	45	803
Over 10,000	8	926	20	1,176	105	1,524
Population not stated	5	37	1	8	10	625
Total	43	2,254	41	2,509	148	3,782

The month of onset of outbreaks is shown in table 6. Water-borne outbreaks were characteristically of summer occurrence, 34 of the 43 reported having started during the 6 months from April through September. Nearly half of the outbreaks began in the single month of July. The same seasonal distribution was common to the three diseases reported.

TABLE 5.—*Outbreaks and cases, 1939, by location and by vehicles*

State	Water supplies		Milk and milk products		Other foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Alabama			1	27	1	26
California	1	2	11	71	62	888
District of Columbia					1	28
Georgia			1	89		
Illinois					1	126
Indiana	3	46	1	199	4	111
Iowa					1	26
Kansas			1	22	10	28
Kentucky	1	14			12	89
Maryland	1	6			6	173
Massachusetts	3	140	1	10	5	421
Michigan					1	4
Minnesota	2	402	2	285		
Missouri	1	10			2	13
New Hampshire			1	70		
New Jersey	1	325			4	21
New Mexico	1	2			2	8
New York	21	935	6	753	28	1,453
North Carolina			2	9		
North Dakota			1	5		
Ohio	1	3	1	21	4	128
Oklahoma			3	303		
Pennsylvania			1	9	2	107
Tennessee			1	4		
Texas	1	150	1	11		
Vermont			1	18		
Virginia	3	111	5	603	1	130
Washington	1	92				
West Virginia	1	8			1	2
Wyoming	1	8				
Total	43	2,254	41	2,509	118	3,782

TABLE 6.—*Outbreaks reported during 1939, by date of onset, disease, and vehicle*

Disease	Water supplies				Milk and milk products				Other foods			
	Jan. to Mar.	Apr. to June	July to Sept.	Oct. to Dec.	Jan. to Mar.	Apr. to June	July to Sept.	Oct. to Dec.	Jan. to Mar.	Apr. to June	July to Sept.	Oct. to Dec.
Botulism									5			4
Dysentery		1	1	1			1	1		2		
Food poisoning [1]					2	3	3	4	10	22	38	17
Gastroenteritis (incl. diarrhea)	3	1	21	2		4	2	1	6	10	17	2
Paratyphoid fever						1	1					2
Scarlet fever					1		1	1	1			
Septic sore throat [2]						2	2	1				
Trichinosis									2			2
Typhoid fever [2]	1	4	6	2	1	1	2	1	2		1	2
Undulant fever							1					
Not stated					1			1	1	1		
Total	4	6	28	5	5	11	13	10	27	35	56	29

[1] Date of onset of 1 food-borne outbreak not reported.
[2] Date of onset of 1 milk-borne outbreak not reported.

OUTBREAKS TRANSMITTED THROUGH MILK AND MILK PRODUCTS

Of the eight diseases listed in table 2 as milk-borne, food poisoning caused the most outbreaks, but septic sore throat contributed by far the most cases and deaths.

TABLE 7.—*Outbreaks transmitted through milk and milk products, 1939, by kind of supply*

Kind of supply	Number of outbreaks	Number of cases	Number of deaths
Sweet milk, raw	20	1,545	6
Sweet milk, pasteurized	4	477	0
Sweet milk, undesignated	2	19	0
Sweet milk, sweet cream, and ice cream, raw	1	274	0
Sweet milk and butter, raw	1	9	1
Sweet milk or ice cream, pasteurized	1	8	0
Buttermilk, raw	1	7	0
Buttermilk, sweet cream and sweet milk, raw	1	89	0
Ice cream, raw	1	12	0
Ice cream, undesignated	5	45	0
Cheese, undesignated	2	14	0
Canned milk	1	4	0
Cream, raw	1	6	0
Total	41	2,509	7

Table 7 shows the type of milk and milk products involved. Sweet milk, either alone or in combination, was the vehicle in 30 outbreaks, ice cream in 8, sweet cream in 3, buttermilk in 2, cheese in 2, and butter and canned milk in 1 each. The percentage of outbreaks involving ice cream, either alone or in combination, in 1939 was twice that reported for the preceding 5 years. Of the 5 outbreaks attributed to pasteurized milk, 1 of food poisoning was traced to dirty milk bottles, 1 of gastroenteritis to a plant employee who filled 10-gallon cans, 1 of paratyphoid fever to flooding of bottled milk, while in 2 the manner of contamination was not determined. The great majority of outbreaks was, as usual, from raw milk and its products. For the 16-year period 1923–1938 the Public Health Service compilation of milk-borne disease outbreaks indicates that about 95 percent of the outbreaks and of the cases involved were caused by raw milk and milk products. Since only about 30 percent of the milk used during this period was raw, the risk of contracting disease from raw milk was about 50 times as great as from milk labeled "pasteurized."

From table 4 it is seen that both milk-borne outbreaks and cases were about equally distributed among communities over and under 10,000 population. In previous years most milk-borne outbreaks have occurred in the smaller communities, where the percentage of milk pasteurized is low and where the least control over milk supplies is exercised. In 1939 one-half of the outbreaks and over three-fourths of the cases occurred in cities of 2,500 to 25,000 population.

Table 5 shows that 30 States failed to report any milk-borne outbreaks, whereas 22 outbreaks, or over half of the total, were reported from 3 States.

The seasonal distribution of milk-borne outbreaks, shown in table 6, is unlike that of water-borne outbreaks. Those from milk are not predominantly warm weather diseases but occur throughout the year.

FOOD-BORNE OUTBREAKS

It is evident from table 2 that, while 8 different diseases were involved in food-borne outbreaks in 1939, the overwhelming majority of outbreaks and cases involved food poisoning and gastroenteritis.

The kind of food responsible for outbreaks is shown in table 8. As in 1938, outbreaks traced to pies and pastry were the most numerous and those due to pork and pork products held second place. By far the largest number of cases, however, occurred in the outbreaks for which the kind of food was not reported.

TABLE 8.—*Food-borne outbreaks, 1939, by kind of food*

Kind of food	Number of outbreaks	Number of cases	Number of deaths
Crab meat	5	365	0
Fowl	7	97	0
Home-canned vegetables, fruits, fish, and meat	10	23	7
Meat and meat products	11	252	0
Miscellaneous	25	583	0
Pies and pastry	32	484	1
Pork and pork products	21	163	2
Salads	8	241	0
Sandwiches	7	181	0
Sauces and gravy	5	94	0
Kind of food not reported	17	1,299	2
Total	148	3,782	12

Table 4, which lists disease outbreaks by size of community, brings out one of the characteristic differences between food-borne outbreaks and those transmitted through water and milk. Over 70 percent of the food-borne outbreaks occurred in cities of over 10,000 population. Apparently the large cities do not excel in food sanitation as they do with respect to sanitation of water and milk.

From table 5 it is evident that the majority of the food-borne outbreaks, like those traced to water and milk, were reported by a very few States, with California far in the lead.

In seasonal distribution (table 6) food-borne outbreaks occupied an intermediate position between the water-borne and the milk-borne outbreaks. The outbreaks of dysentery, food poisoning, and gastroenteritis caused by foods had their onset largely during the warmer months, but outbreaks of the other diseases occurred more frequently during cooler weather.

COMPLETENESS OF REPORTING

The evidence indicates that the reports of outbreaks due to water, milk, and other foods received by the Public Health Service during 1939 and discussed in this paper are far from complete.

The increase in the number of outbreaks reported from other foods from 70 in 1938, the first year for which these reports were collected, to 148 in 1939, is probably due, in part at least, to better reporting.

The extreme differences between the large number of outbreaks reported by a few States and the small number or entire absence of reports from many other States are out of all proportion to the relative populations of the States. For example, 1 State, with only one-tenth of the country's population, reported practically one-half of all the water-borne outbreaks. Again, 3 States reported over one-half of all the milk-borne outbreaks. Similarly, 2 States accounted for more than half of all the food-borne outbreaks. From our knowledge of the quality and extent of the public health activities of these States it would be unreasonable to assume that they are below average in environmental sanitation. On the contrary, the logical explanation probably lies in their efficient epidemiological organization for uncovering outbreaks and in their willingness to report such outbreaks. These States are to be congratulated, for their example may encourage neighboring States to improve their efforts in this important field.

ANALYSIS OF HUMAN TUMORS DIAGNOSED AT THE NATIONAL INSTITUTE OF HEALTH, 1920–39 [1]

By R. D. Lillie, *Senior Surgeon, United States Public Health Service*

Some 8 years ago we were struck by the relative frequency of certain specific tumor types in white seamen, and summarization of the material then available confirmed this impression. However, the series was relatively small and it was decided to await the accumulation of a larger number of cases.

By May 1939, there had accumulated a series of 2,066 malignant tumors occurring in 2,039 individuals. In addition, there were 1,222 benign tumors from 1,219 persons, making a total of 3,288 tumors in 3,247 persons.

The classification followed is based chiefly on Ewing's Neoplastic Diseases (*1*). All malignant and most of the benign tumors were studied personally by the author, and the diagnoses finally used in the tabulation were often revised from the originals in accord with the results of restudy, later biopsies, or autopsy.

Table 1 gives the number of cases and percentage distribution of malignant and "borderline" tumors according to race and sex,

[1] From the Division of Pathology, National Institute of Health.

dividing the white males further into seafaring and nonseafaring (or seamen and landsmen). As it was not possible to estimate the population groups from which these tumors were derived, it was thought that comparison of the percentages of tumors falling into each diagnosis for the several race, sex, and occupation groups would prove of value.

Noteworthy differences are observed in carcinoma of the prostate, which forms 4.6 percent of all malignant tumors in white seamen and only 2.6 percent in landsmen (1.77:1); testis, 2.4 percent in white seamen, 3.4 percent in landsmen (1:1.4); and kidney, 1.9 and 0.9 percent in white seamen and landsmen, respectively (2.11:1). The gastrointestinal tumors show considerable variations in seamen and landsmen (lip 7.0:4.2 percent, oral 4.0:2.5, esophagus 1.4:0.5, stomach 8.2:4.0, intestine and anus 9.5:8.4).

It was thought that these variations might be due to differences in the age distribution of the seafaring and nonseafaring groups. Consequently, all tumors were further segregated according to 10-year age groups of the patients at the time of the first histologic diagnosis.

Table 2 gives the age distribution by decades of all patients with malignant tumors. Since definite differences in age distribution between white seamen and landsmen were found, those tumor types showing differences were further studied in relation to age distribution (table 3).

In regard to the prostatic carcinomas, it seems evident that the seaman-landsman ratio of 1.77:1 is artificial and is due to the larger number of seamen in the older age groups; the ratios vary in the several decades—19:6 in the fifth, 1:1.4 in the sixth, 1.57:1 in the seventh, 1:1.1 in the eighth—at first the seamen and then the landsmen showing the higher rate, with discrepancies remaining small.

The incidence of testicular carcinoma is highest, and approximately equal, in the two groups in the third decade, with a slightly higher incidence in landsmen in the fourth and fifth decades. However, the number of cases is small in the latter age groups.

Renal carcinoma shows a rather striking difference between seamen and landsmen in its decade of highest proportional incidence, the sixth, the proportion between the incidence rates in that decade being 3.3:1. Before and after the sixth decade, the differences in incidence rates are small and probably not significant. The total number of cases is small, and the differences are to be regarded as suggestive only.

Carcinomas of the lip, tongue, and oral cavity show a consistently higher incidence in seamen in all decades in which significant numbers of cases occur. The proportionate difference between seamen and landsmen is least in the fifth and sixth decades, greater in the fourth, seventh, and eighth decades.

TABLE 1.—*Type distribution of tumors by race and sex, all ages*

Tumor	White seamen		White landsmen		White females		Negro males		Negro females		Indian males		Indian females		Male Mongolian, Malaysian, Polynesian	Deficient data	Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Number	Number	Percent
Acanthoma, penis	10	1.0	7	1.1			5	3.7			1	4.3			1	0	24	1.17
Carcinoma, prostate	[1,2] 46	4.6	17	2.6			6	4.5			1	4.3					70	[1,2] 3.42
Carcinoma of testis	[3] 21	2.1	[3] 22	3.4			1	.7			1	4.3					43	[3,4] 2.10
"Benign" teratoma of testis	0		1	.15			0				0					1	2	.10
Retroperitoneal malignant tumors	[3] 10	1.0	[4,5] 5	.8			0				0					0	15	[3,4,5] .73
Benign teratoma, others	3	.3	1	.15	2	1.5	0				0					0	6	.29
Carcinoma, cervix					[6] 16	11.8			3	25.0			18	35.3		1	38	[6] 1.85
Carcinoma, uterus					6	4.4							1	2.0		[7] 1	8	[7] .39
Sarcoma, uterus					1	.7							1	2.0			2	.10
Carcinoma, ovary					5	3.7										[7] 1	6	[7] .29
Carcinoma, bladder	21	2.1	17	2.6			3	2.2			1	4.3				1	43	2.10
Carcinoma, renal pelvis	2	.2	3	.5													5	.24
Carcinoma, kidney	19	1.9	6	.9	[6] 2	1.5	1	.7									28	[6] 1.37
Hypernephroma	5	.5	2	.3			2	1.5								1	10	.49
Renal mixed tumor			2	.3	1	.7											3	.15
Neuroblastoma, adrenal							1	.7									1	.05
Angioendothelioma epididymis	1	.1															1	.05
Sarcoma, myosarcoma, bladder	1	.1	1	.15	1	.7											3	.15
Sarcoma, breast					1	.7											1	
Carcinoma, breast	4	.4	1	.15	39	28.9			5	41.7			[8] 9	17.7			58	[8] 2.83
Total genito-urinary and breast	146	14.6	85	13.1	73	54.1	19	14.2	8	66.7	4	17.4	29	56.9	1	5	370	18.06
Acanthoma of lip	[9] 70	7.0	27	4.2	1	.7	1	.7									99	[9] 4.83
Carcinoma, tongue, mouth	40	4.0	[10] 17	2.6			3	2.2									60	[10] 2.93
Carcinoma, tonsil, pharynx	[11] 13	1.3	8	1.2			[11] 4	3.0							1		26	[11] 1.27
Carcinoma, salivary glands	[12] 11	1.1	[13] 5	.8												2	18	[12,13] .88
Mixed tumors, salivary	[9] 22	2.2	24	3.7	2	1.5	6	4.5			2	8.7	3	5.9			59	[9] 2.88
Adamantinoma	2	.2	1	.15			3	2.2			1	4.3					7	.34

Carcinoma, esophagus	[14] 14	1.4	3	.5			1	.7									18	[14] .88
Carcinoma, stomach	[11] 82	8.2	29	4.0	1	.7	[11] 10	7.5	1	8.3			1	2.0			121	[11] 5.90
Carcinoma, intestines	[1] 77	7.7	[23] 51	7.9	3	2.2	5	3.7			3	13.0	2	3.9			141	[1, 23] 6.88
Carcinoma, appendix	9	.9	2	.3			1	.7					3	5.9		1	16	.78
Carcinoma, anus	7	.7	1	.15													8	.39
Biliary carcinoma	8	.8	5	.8	1	.7	3	2.2					1	2.0			18	.88
Hepatoma	4	.4	7	1.1			4	3.0							1		16	.78
Carcinoma, pancreas	[14] 9	.9	12	1.85			6	4.5									27	[14] 1.32
Epulis	4	.4	0														4	.20
Sarcoma	1	.1	2	.3			1	.7									4	.20
Myosarcoma	2	.2	1	.15													3	.15
Neurofibrosarcoma	1	.1	1	.15	1	.7											3	.15
Angioendothelioma	6	.6	2	.3			1	.7		8.3							9	.44
Total gastrointestinal	379	37.8	195	30.1	9	6.7	48	35.8	1	8.3	6	26.1	10	19.6	2	3	653	31.9
Acanthoma	[15, 16, 17] 70	7.0	[22] 42	6.5	[18] 9	6.7	6	4.5	1	8.3	4	17.4	1	2.0	1	5	139	[15, 16, 17, 18, 22] 6.78
Basal cell carcinoma	[18, 19, 21] 69	6.9	[20, 22] 54	8.3	[18] 10	7.4	1	.7			1	4.3	[8] 3	2.0		7	145	[8, 18, 19, 20, 21, 22] 7.04
Adenoid cystic carcinoma	[18, 19] 21	2.1	13	2.0	4	3.0					1	4.3				1	40	[18, 19] 1.95
Adnexal adenocarcinoma and carcinoma	[2] 5	.5	2	.3	2	1.5	2	1.5								2	13	[2] .58
Naevocarcinoma melanoma	15	1.5	[20] 15	2.3	2	1.5	1	.7			3	13.0			1	1	38	[20] 1.85
Sarcoma, fibrosarcoma	13	1.3	13	2.0	1	.7	2	1.5			1	4.3					30	1.46
Neurofibroma and sarcoma	[25] 18	1.8	18	2.8	3	2.2	5	3.7									44	[25] 2.15
Myosarcoma			1	.15													1	.05
Angioendothelioma	[25] 5	.5	7	1.1	1	.7	1	.7								1	15	[25] .73
Xanthoma	12	1.2	6	.9	1	.7	2	1.5							1	1	23	1.12
Total, skin	223	22.2	169	26.1	32	23.7	20	14.9	1	8.3	10	43.5	4	7.8	3	18	480	23.43
Carcinoma, lung	27	2.7	26	4.0			7	5.2								2	62	3.03
Carcinoma, larynx	14	1.4	6	.9													20	.98
Carcinoma, nasal and sinus	7	.7	4	.6	1	0.7	2	1.5							1		15	.73
Carcinoma, thyroid	4	.4	8	1.2	3	2.2	1	.7					1	2.0			17	.83
Carcinoma, thymus	2	.2															2	.10
Carcinoma, parathyroid			1	.15													1	.05
Perithelioma, carotid	1	.1	2	.3													3	.15
Angioendothelioma, nasal			1	.15	1	.7											2	.10
Sarcoma, nasal and sinus	2	.2	1	.15													3	.15
Acanthoma, branchiogenic	5	.5	3	.46	1	.7											9	.44
Transitional cell carcinoma cervical lymph node	10	1.0	[22] 9	1.4									1	2.0			20	[22] .98
Total respiratory	72	7.2	61	9.4	6	4.4	10	7.5					2	3.9	1	2	154	7.52

See footnotes at end of table.

TABLE 1.—*Type distribution of tumors by race and sex, all ages*—Continued

Tumor	White seamen		White landsmen		White females		Negro males		Negro females		Indian males		Indian females		Male Mongolian, Malaysian, Polynesian	Deficient data	Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Number	Number	Percent
Mesothelioma serosal	0		4	0.6			1	0.7								1	6	0.29
Metastatic carcinoma (source?)	26	2.6	25	3	3	2.2	6	4.5	1	8.3			1	2.0			62	3.03
Lymphocytoma, sarcoma	[26] 32	3.2	19	2.9	3	2.2	5	3.7					1	2.0	2		62	[26] 3.03
Myelocytoma, myeloma	11	1.1	9	1.4											1		21	1.03
Hodgkin's and reticulum cell sarcoma	[26] 30	3.0	27	4.2			3	2.2			1	4.3					61	[26] 2.98
Total lymphatic	71	7.1	55	8.5	3	2.2	8	6.0			1	4.3	1	2.0	3	0	142	6.93
Fascial sarcoma	17	1.7	9	1.4	1	.7	4	3.0					1	2.0	1		33	1.60
Neurogenic sarcoma, deep	14	1.4	8	1.2			7	5.2			1	4.3	2	3.9			32	1.56
Myxochondroma, chondrosarcoma	11	1.1	3	.5													14	.68
Bone sarcoma	5	.5	6	.9			5	3.7								1	17	.83
Chordoma	1	.1															1	.05
Angioendothelioma, deep	2	.2															2	.10
Subtotal	50	5.0	26	4.0	1	.7	16	11.9			1	4.3	3	5.9	1	1	99	4.83
Giant cell tumor, tendons and aponeuroses	16	1.6	13	2.0	2	1.5	2	1.5								1	34	1.66
Giant cell tumor, bone	3	.3	1	.15			1	.7					1	2.0			6	.29
Subtotal	19	1.9	14	2.2	2	1.5	3	2.2					1			1	40	1.95
Total locomotor system	69	6.9	40	6.2	3	2.2	19	14.2			1	4.3	4	7.8	1	2	139	6.78
Glioma cerebri	8	.8	7	1.1	1	.7	2	1.5									18	.88
Retinoblastoma					2	1.5			1	8.3	1	4.3					4	.20
Angiosarcoma meningeal	4	.4	1	.15	1	.9											6	.29
Orbital psammoma			1	.15													1	.05
Neurofibrosarcoma cauda equina	1	.1	1	.15													2	.10

Lacrimal carcinoma	1	.1															1	.05
Melanosarcoma chorioid	4	.4	5	.8	2	1.5							1	2.0			12	.59
Acanthoma conjunctival	1	.1					1	.7								1	3	.15
Total central nervous system and eye	19	1.9	15	2.3	6	4.4	3	2.2	1	8.3	1	4.3	1	2.0		1	47	2.29
Total cases, malignant and borderline	1,003	100.0	648	100.0	135	100.0	134	100.0	12	100	23	100	51	100.0	11	32	2,049	100.0
Total tumors	1,023	102.0	653	100.8	138	102.2	135	100.7	12	100	23	100	53	104.0	11	33	2,071	101.1

[1] 1 case entered under carcinoma of intestine and of prostate.
[2] 1 case entered under carcinoma of prostate and of cutaneous glands.
[3] 3 cases under each heading showed teratoma as well.
[4] 2 cases under each heading showed teratoma as well.
[5] Includes 1 case of rhabdomyosarcoma.
[6] 1 case under carcinoma of cervix and of kidney.
[7] 1 case under carcinoma of uterus and of ovary.
[8] 1 case under carcinoma of breast and basal cell epithelioma of skin.
[9] 1 case under acanthoma of lip and salivary mixed tumor.
[10] 1 case with 2 independent tumors 1 year apart.
[11] 2 cases under carcinoma of pharynx and of stomach, 1 white seaman, 1 Negro male.
[12] 3 cases showed also mixed tumor elements, but not entered under that heading.
[13] 1 case showed mixed adenocarcinoma and chondrosarcoma, not entered under the second.
[14] 1 case under carcinoma of esophagus and of pancreas.
[15] 1 case with 1 acanthoma, 2 basal cell and 1 adenoid cystic epithelioma of skin, white seaman.
[16] 1 case with 3 acanthomas, white seaman.
[17] 1 case with 2 acanthomas, white seaman.
[18] 1 case with acanthoma and basal cell epithelioma, white female.
[19] 1 case with basal cell and adenoid cystic epitheliomas, white seaman.
[20] 1 case with basal cell epithelioma and cutaneous melanoma, white landsman.
[21] 1 case with 2 basal cell epitheliomas, white seaman.
[22] 1 case with acanthomata of skin and of cervical lymph nodes and basal cell epithelioma, white landsman.
[23] 2 cases with 2 carcinomas of intestine, both white landsmen.
[24] 1 case with carcinomas of both breasts.
[25] 1 case with neurofibroma and angioendothelioma of skin.
[26] 2 cases diagnosed first under lymphocytic, later under Hodgkin's.

Cases in which 2 diagnoses were made on the same tumor or same process as under footnote 2 are counted as 1 tumor under total tumors; in those in which apparently independent tumors were present, these are counted separately under total tumors.

W=white: B=negro; I=Indian; L=landsman; M=male; F=female; S=seaman.

TABLE 2.—*Age distribution by decades of malignant and borderline tumor cases by race and sex*

	Under 10		10–19		20–29		30–39		40–49		50–59		60–69		70+		Unknown		Total	
	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000	Number	Per 1,000
White seamen	0	-----	2	2.0	101	100	137	136	211	211	257	256	202	201	78	78	15	15	1,003	1,000
White landsmen	2	3.1	6	9.3	43	67.0	145	221.2	174	269.4	147	227.3	91	140.2	26	40.5	14	21.8	648	1,000
White females	1	7.4	2	7.4	9	66.7	19	140.7	25	192.6	34	251.8	18	133.3	6	44.4	21	155.5	135	1,000
Negro males	0	-----	4	29.8	12	89.6	23	171.6	52	388.0	24	179.1	13	97.0	6	44.8	0	-----	134	1,000
Negro females	1	8.3	1	8.3	3	25.0	4	33.3	1	8.3	1	8.3	0	-----	0	-----	1	8.3	12	1,000
Indian males	1	41.7	1	41.7	1	83.4	1	41.7	3	125.0	4	166.7	6	250.0	2	83.4	4	166.7	23	1,000
Indian females	1	20.0	2	40.0	6	100.0	3	60.0	14	280.0	10	200.0	10	200.0	2	40.0	3	60.0	51	1,000
Mongolian and Malaysian males	-----	-----	-----	-----	2	200.0	3	200.0	3	300.0	1	100.0	-----	-----	-----	-----	2	200.0	11	1,000
Unclassified	-----	-----	-----	-----	1	32.2	1	32.2	-----	-----	1	32.2	1	32.2	1	32.2	27	838.5	32	1,000
Total	6	2.9	18	8.3	178	85.3	336	161.8	483	237.3	479	234.8	311	166.7	121	59.3	87	42.2	2,049	1,000

TABLE 3.—*Comparison of incidence rates of certain tumors in the various decades of life between white male seamen and landsmen*

	20–29		30–39		40–49		50–59		60–69		70 and over		Total	
	S	L	S	L	S	L	S	L	S	L	S	L	S	L
Carcinoma, prostate	-----	-----	-----	-----	1.9	0.6	2.3	3.4	13.9	8.9	10.4	11.5	4.6	2.6
Carcinoma, testis	11.0	11.6	5.1	7.75	1.4	3.5	.8	-----	.5	-----	-----	-----	2.4	3.4
Carcinoma, kidney	1.0	-----	.7	1.4	.5	.6	4.65	1.4	1.5	1.1	1.3	-----	1.9	.9
Carcinoma, lip	1.0	4.6	7.3	2.8	5.2	4.0	8.5	6.2	9.9	5.6	5.2	-----	7.0	4.2
Carcinoma, tongue and mouth	-----	-----	.7	.7	3.3	2.9	5.8	4.8	5.0	2.2	6.5	3.8	4.0	2.5
Carcinoma, esophagus	-----	-----	-----	-----	.5	-----	2.7	-----	2.5	2.2	1.3	-----	1.4	.5
Carcinoma, stomach	2.0	4.6	5.9	4.2	9.4	3.5	13.6	3.4	6.9	6.7	2.6	3.8	8.2	4.0
Carcinoma, intestines	9.0	2.3	4.4	10.5	11.7	8.7	8.1	8.9	12.4	10.0	11.7	3.8	9.5	8.4
Hepatoma	-----	-----	-----	1.4	.5	1.2	.4	1.4	1.0	-----	-----	3.8	.11	1.1
Carcinoma, pancreas	-----	-----	.7	-----	.5	2.3	1.9	.7	.5	5.0	1.3	3.8	.09	1.9
Biliary carcinoma	-----	-----	-----	-----	1.4	1.2	.4	.7	1.5	1.0	-----	3.8	.08	.8
Carcinoma, lung, larynx	1.0	-----	1.5	1.4	4.9	6.9	3.1	5.5	2	3.3	-----	3.8	2.6	4.1
All malignant tumors	100	100	100	100	100	100	100	100	100	100	100	100	100	100

The number of cases of carcinoma of the esophagus is too small to have much significance, but the difference between seamen and landsmen is not explained by differences in age distribution.

There is no significant difference in the incidence of stomach carcinoma in the third, fourth, seventh, and eighth decades, while the incidence in seamen is three to four times as high as in landsmen in the two decades of maximum proportionate incidence, the fifth and sixth. Intestinal and anal carcinoma, with nearly equal total incidence in the two groups, shows no significant difference in any age group.

The greater incidence of lung carcinoma in landsmen (4.1:2.6 percent) is consistent through the decades of maximum proportionate incidence (fifth, sixth, and seventh) and greatest in the sixth.

When the group of white seamen is broken down into the traditional three divisions of deck, engine-room, and stewards' departments (table 4), it is seen that while, for example, gastrointestinal tumors make up 36 to 39 percent of all malignant tumors in the three groups, acanthoma of the lip causes 7.4 percent of all malignancies in the deck force and only 4 to 4.3 percent in the engine-room and stewards' forces. The latter figure is essentially the same as in white landsmen (4.2 percent). Tongue and mouth cancers are also relatively higher in the deck force (5.1 percent), but the difference is smaller. The deck force shows about the same proportion of stomach and intestinal cancers (8.3 and 8.9 percent), the engine-room workers more stomach cancer than intestinal (10.1 and 8.5 percent), and the stewards' force presents a higher incidence but similar proportions to the white landsmen (6.9 and 12.9 percent compared with 4 and 8.3 percent). For skin tumors, the deck force shows the highest incidence (19.3 percent), the engine group intermediate (17.6 percent), and the stewards' force the lowest (12.9 percent). The acanthomas show the most difference; the basal cell group the least. Small differences are seen in the incidence of genitourinary tumors; the highest incidence is in the engine-room group, the least in the stewards' force. Tumors of the supporting tissues show similarly small variations. Lymphatic tumors seem more frequent in the stewards' force (11.9 percent) than in deck and engine groups (7.4 and 5.8 percent). The landsmen showed an incidence like that in the latter groups (8.1). Tumors of the lung were lowest in deck and stewards' groups (2.4 and 2 percent), higher in the engine-room force (3.2 percent), but still lower than in white landsmen (4.05 percent).

TABLE 4.—*Segregation of tumors of seamen according to place of employment on board ship*

	Watchmen, seamen, merchant seaman, Coast Guard [1]		Deck, surfman, pilot		Engine		Steward		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
SKIN										
Angioendothelioma	3	0.8	1	0.3	1	0.5	0	------	5	0.5
Acanthoma	30	7.9	27	8.0	9	4.8	4	4.0	70	7.0
Basal cell	36	9.5	19	5.6	8	4.3	6	5.9	69	6.9
Adenoid (cystic)	13	3.4	4	1.2	2	1.1	2	2.0	21	2.1
Adnexal adenoma	3	.8	0	------	1	.5	1	1.0	5	.5
Naevomelanoma malignum	8	2.1	4	1.2	3	1.6	0	------	15	1.5
Sarcoma fibrosarcoma	4	1.1	6	1.8	3	1.6	0	------	13	1.3
Neurosarcoma	12	3.2	2	.6	2	1.1	2	------	18	1.8
Xanthoma, giant cell	5	1.3	3	.9	4	2.1	0	------	12	1.2
	114	30.1	66	19.6	33	17.6	15	12.9	228	22.8
	−4	1.1	−1	0.3	------	------	------	------	−5	0.5
Total	110	29.0	65	19.3	33	17.6	15	12.9	223	22.3
GENITOURINARY										
Acanthoma, penis	2	0.5	4	1.2	4	2.1	0	------	10	1.0
Carcinoma, prostate	14	3.7	20	6.0	9	4.8	3	3.0	46	4.6
Carcinoma, testis	12	3.2	3	.9	7	3.7	2	2.0	24	2.4
Teratoma and embryonal carcinoma	2	.5	3	.9	2	1.1	2	2.0	9	.9
Carcinoma, bladder	5	1.3	10	3.0	3	1.6	3	3.0	21	2.1
Carcinoma and hypernephroma, kidney, renal pelvis	2	.5	12	3.6	9	4.8	3	3.0	26	2.6
Carcinoma, breast	0	------	3	.9	1	.5	0	------	4	.4
	37	------	55	------	35	------	13	------	140	------
Sarcoma	------	------	1	------	2	1.1	------	------	3	.3
Total	37	9.8	56	16.7	37	19.7	13	12.9	143	14.2
SUPPORTING TISSUES										
Myxoma, sarcoma	1	0.3	------	------	------	------	------	------	1	0.1
Deep fibroblastic and fibrosarcoma	7	1.8	5	1.5	2	1.1	2	2.0	16	1.6
Neurosarcoma deep	2	.5	6	1.8	4	2.1	2	2.0	14	1.4
Chondrosarcoma, chordoma	1	.3	4	1.2	5	2.7	2	2.0	12	1.2
Bone sarcoma	2	.5	1	.3	1	.5	1	1.0	5	.5
Xanthoma of tendons and aponeuroses	7	1.8	4	1.2	4	2.1	1	1.0	16	1.6
Giant cell bone	1	.3	------	------	2	1.1	------	------	3	.3
Angioendothelioma, deep	1	.3	1	.3	------	------	------	------	2	.2
Total	22	5.8	21	6.2	18	9.6	8	7.9	69	6.9
EYE AND CENTRAL NERVOUS SYSTEM										
Glioma cerebri	4	1.1	2	0.6	2	1.1	0	------	8	0.8
Angiosarcoma meningeal	2	.5	3	.9	0	------	0	------	5	.5
Melanosarcoma chorioid	1	.3	3	.9	0	------	0	------	4	.4
Neurosarcoma cauda equina	0	------	1	.3	0	------	0	------	1	.1
Acanthoma conjunctival	0	------	0	------	0	------	1	1.0	1	.1
Total	7	1.8	9	2.7	2	1.1	1	1.0	19	1.9

[1] This group includes "retired," "Coast Guard," and "watchmen." Note high incidence of skin tumors

TABLE 4.—*Segregation of tumors of seamen according to place of employment on board ship*—Continued

LYMPHATIC

	Watchmen, seamen, merchant seaman, Coast Guard		Deck, surfman, pilot		Engine		Steward		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Lymphosarcoma and -cytoma	10	2.6	11	3.3	7	3.7	4	4.0	32	3.2
Myelosarcoma and -cytoma	2	.5	6	1.8	0		3	3.0	11	1.1
Reticulosarcoma and Hodgkin's	12	3.2	8	2.4	4	2.1	6	5.9	30	3.0
	24	6.3	25	7.4	11	5.8	13	12.9	73	7.3
	−1	6.3					−1	1.0	−2	.2
Total	23	6.1	25	7.4	11	5.8	12	11.9	71	7.1
RESPIRATORY										
Carcinoma, lung	10	2.6	8	2.4	6	3.2	2	2.0	26	2.6
Carcinoma, larynx	7	1.8	3	.9	2	1.1	2	2.0	14	1.4
Nasal and sinus carcinoma	3	.8	2	.6	2	1.1	0		7	.7
Carcinoma, thyroid	2	.5	0		0		2	2.0	4	.4
Carcinoma, neck and branch	4	1.1	5	1.5	2	1.1	4	4.0	15	1.5
Antral sarcoma	0		1	.3	0		1	1.0	2	.2
Thymic carcinoma	0		2	.6	0		0		2	.2
Carotid tumor	0		1	.3	0		0		1	.1
Total	26	6.9	22	6.5	12	6.4	11	10.9	71	7.1
SOURCE UNDETERMINED										
Carcinoma	11	2.9	7	2.1	7	3.7	2	2.0	27	2.7
GASTROINTESTINAL										
Acanthoma, lip	33	8.7	25	7.4	8	4.3	4	4.0	70	7.0
Carcinoma, tongue, mouth	12	3.2	17	5.1	8	4.3	3	3.0	40	4.0
Carcinoma, tonsil and pharynx	5	1.3	3	.9	3	1.6	2	2.0	13	1.3
Carcinoma, salivary glands	4	1.1	4	1.2	2	1.1	1	1.0	11	1.1
Carcinoma, esophagus	5	1.3	6	1.8	1	.5	2	2.0	14	1.4
Carcinoma, stomach	28	7.4	28	8.3	19	10.1	7	6.9	82	8.2
Carcinoma, intestine	28	7.4	27	8.0	11	5.8	13	12.9	79	7.9
Carcinoma, appendix	4	1.1	2	.6	3	1.6	0		9	.9
Rectal acanthoma	4	1.1	1	.3	2	1.1	0		7	.7
Carcinoma gall bladder and biliary tract	3	.8	5	1.5	0		0		8	.8
Hepatoma	0		2	.6	0		2	2.0	4	.4
Carcinoma, pancreas	0		2	.6	4	2.1	3	3.0	9	.9
Adamantinoma	0		2	.6	0		0		2	.2
Salivary mixed tumor	10	2.6	4	1.2	9	4.8	2	2.0	25	2.5
Epulis	3	.8	1	.3	0		0		4	.4
Angioendothelioma	4	1.1	2	.6	0		0		6	.6
Sarcoma	2	.5	2	.6	0		0		4	.4
	145	38.3	133	39.6	70	37.2	39	38.6	387	38.5
	−1	.3	−2	.6	−1				−4	.4
Total	144	38.0	131	39.0	69	36.7	39	38.6	383	38.1
ALL MALIGNANT TUMORS										
Skin	110	29.0	65	19.3	33	17.6	15	14.8	223	22.2
Genitourinary	37	9.8	56	16.7	37	19.7	13	12.9	143	14.2
Lymphatic tumors	23	6.1	25	7.4	11	5.8	12	11.9	71	7.1
Eyes and central nervous system	7	1.8	9	2.7	2	.4	1	1.0	19	1.9
Respiratory	26	6.9	22	6.5	12	6.4	11	10.9	71	7.1
Supporting tissues	22	5.8	21	6.2	18	9.6	8	7.9	69	6.9
Gastrointestinal	144	38.0	131	39.0	69	36.7	39	38.6	383	38.1
Source undetermined	11	2.9	7	2.1	7	3.7	2	2.0	27	2.7
Total	380	100.3	336	100.0	189	100.5	101	100.0	1,006	100.2
Duplicates	1	.3			1	.5			2	.2
Net	379	100	336	100	188	100	101	100	1,004	100

TABLE 5.—*Age and race in relation to female genital and breast cancers*

	20–29			30–39			40–49			50–59			60–69			70+			Total		
	White	Negro	Indian	White	Negro	Indian	White	Negro	Indian	White	Negro	Indian	White	Negro	Indian	White	Negro	Indian	White	Negro	Indian
Carcinoma, cervix	1	--	1	3	--	1	5	--	6	4	---	5	1	--	3	0	--	1	16		18
Carcinoma, uterus	0	---	1	0	---	0	2	--	0	1	---	0	2	-	0	0	- -	0	6	--	1
Sarcoma, uterus	0	-	0	0	--	0	0	--	0	0	--	0	1	--	1		-	0	1	-	1
Carcinoma, ovary	0	--	0	0	-	0	0	--	0	3	-	0	1	-	0	0	--	0	5	--	0
Carcinoma, breast	2	-	1	5	3	1	8	-	2	12	1	3	4	-	2	2	--	0	39	5	9
All malignant tumors	9	2	5	19	3	3	26	0	14	34	1	10	18	0	10	6	0	2	135	9	50

In table 1, we note that the white women had about 17 percent malignant uterine tumors and 29 percent breast cancers, while Indian women showed 40 percent uterine and 18 percent breast tumors. No explanation for these differences is found in the ages of the patients (table 5). Quinland and Cuff (*9*) reported 51.4 percent uterine cancers and 29.4 percent breast tumors in Tennessee Negro women.

In 135 male Negroes, lip carcinoma occurred once, stomach cancer was about as frequent as in white males, intestinal carcinoma was less frequent, while carcinomas of liver, biliary tract, and pancreas appeared in 9.5 percent (13 cases) compared with 3.8 percent (24 cases) in white landsmen and 2.1 percent (21 cases) in seamen. Skin carcinoma and melanoma were infrequent (10 cases, 7.5 percent) (white seamen, 180 cases, 18 percent, landsmen, 126 cases, 19.6 percent), sarcoma and xanthoma cutis slightly more frequent (10 cases, 7.5 percent) than in white males (48 and 45 cases, 4.8 and 7.0 percent, for seamen and landsmen, respectively). Penile acanthoma occurred in 5 Negroes (3.7 percent as compared with 1 in white seamen and 1.1 percent in white landsmen); other urogenital tumors were similar in frequency to those in white males except that there was only 1 case of testicular carcinoma among the Negroes. There were 6 cases of lung carcinoma (4.5 percent, as compared with 2.6 and 4.1 percent in white seamen and landsmen, respectively). Other respiratory tract and lymphatic tumors showed incidences similar to those in white males. Sarcomas and giant cell tumors of the locomotor system constituted 14 percent of all tumors in Negro males (6.9 and 6.7 percent in white males). Giant cell tumors, whether cutaneous, epulis, fascial, or bone, show similar incidence in white and Negro males. When all sarcomas are considered, they comprise 10.9 percent of all tumors in white seamen, 13.7 percent in landsmen, 10.4 percent in white females, 20.1 percent in Negro males, 8.3 percent in Indian males, and 10 percent in Indian females.

TABLE 6.—*Tabulation of all sarcomas, by age, sex, and race*

	10–19		20–29		30–39		40–49		50–59		60–69		70 and over		Age unknown		Total	
	Number	Percent[1]	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
White seamen	2	100.0	25	25.0	24	17.6	24	11.3	21	8 1	8	4.0	2	2.6	3	20.0	109	10.9
White landsmen	2	83.3	11	25.6	25	17.6	25	14.4	14	9.6	5	5.6	1	3.8	5	35.7	88	13.7
White females	1	100.0	0	-----	3	16.3	0	-----	3	8.5	2	11.1	0	-----	5	23.8	14	10.4
Negro males	4	100.0	2	16.7	6	26.1	12	23.1	1	4.2	2	15.4	---	-----	---	-----	27	20.1
Negro females	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	0
Indian males	---	-----	---	-----	---	-----	---	-----	---	-----	1	16.7	---	-----	1	25.0	2	8.3
Indian females	---	-----	---	-----	---	-----	1	7.1	---	-----	2	20.0	1	50.0	1	33.8	5	10.0
Other males	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	0
Unknown	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	---	-----	3	11.5	3	9.7
Total	9	53.0	38	21.8	58	17.6	62	12.8	39	8.1	20	5.9	4	3.3	18	20.9	248	12.2
Sarcomas	---	5.3	---	20.1	---	30.7	---	32.8	---	20.6	---	10.6	---	2.1	---	9.5	---	100
All tumors	---	.83	---	8.5	---	16.2	---	23.7	---	23.5	---	16.7	---	5.9	---	4.2	---	100

[1] These percentages refer to the total number of tumors in the age and sex group for the decade.

Analysis of these sarcomas according to age of patients, presented in table 6, shows that the increased incidence in Negro males is not assignable to age differences. The high proportion of sarcomas as compared with other tumors in the younger age groups is in accord with usual findings. The close correspondence of the proportionate incidence of sarcomas in white seamen and landsmen in the various decades is of interest. Seamen might be thought to be more subject to traumatism and yet landsmen show a slightly higher proportion of sarcomas. This difference, however, lies entirely in the skin sarcomas (3.6 percent in seamen, 6.3 percent in landsmen; other sarcomas 7.3 and 7.4 percent).

DISCUSSION

Series comparable to the present one are hard to find. Dorn's report (*2*) lists 9,863 cases with microscopic diagnoses, but these were not segregated by sex or color, and his table of distribution by sex and color is not comparable because the percentage of histologic examinations varied very considerably from site to site. Mountin, Dorn, and Boone's report (*3*) was of similar type. Gover's recent report (*4*) deals with reported mortality and, moreover, makes no distinction as to specific tumor types.

The recent report of Quinland and Cuff (*9*) on tumors in 300 Tennessee Negroes gives figures comparable to ours on this racial group. There were very few Negro women in our series. It is apparent that the males of their series were older than ours (median in the fifth decade in our series, in the sixth in theirs), and this probably accounts for their relatively high incidence of prostatic carcinoma (37.8 percent, as compared with 4.5 percent in our series). Stomach

cancers showed comparable frequencies in Negro males in both series, 7.5 percent in our series, and 9.7 percent in theirs, assuming that all 8 cases were in males. The incidence of liver and pancreatic tumors in Negro males is high in both series (7.5 percent in ours and 8.5 percent in theirs).

TABLE 7.—*Number and percentage distribution of microscopically diagnosed cases of cancer, Chicago, Ill., 1937*

[From Dorn (2), Appendix table 1]

	Cases	Percent		Cases	Percent
Lip	277	2.81	Others	72	0.73
Tongue	176	1.78	Total	494	5.01
Mouth	54	.55	Uterus	1,544	15.65
Jaw	90	.91	Kidneys	139	1.41
Pharynx	34	.34	Prostate	363	3.68
Others	177	1.79	Bladder	433	4.39
Total	808	8.19	Others	476	4.82
Esophagus	118	1.20	Total	2,955	29.95
Stomach, duodenum	573	5.81	Breast	1,835	18.60
Intestines	575	5.83	Skin	741	7.52
Rectum, anus	689	6.98	Brain	67	.68
Liver and bile ducts	130	1.32	Bones	170	1.72
Pancreas	80	.81	Others	585	5.93
Peritoneum	43	.44	Total	3,398	34.45
Total	2,208	22.40	Grand total	9,863	100.00
Larynx	217	2.20			
Lung, pleura	205	2.08			

DETAILED DIAGNOSTIC CLASSIFICATION

Under acanthoma of lip are included 2 cases classed as transitional cell epithelioma, 1 as basal cell epithelioma, 1 as adenoid epithelioma (noncystic), and the remaining 96 as acanthoma.

Under carcinoma of tongue and oral cavity are included 18 tumors of the tongue, 6 of the lower jaw, 6 of the palate and upper jaw, 1 of the uvula, 11 of the cheek, 10 of the floor of the mouth, 2 of the gums, and 6 of the oral mucosa. Acanthoma was diagnosed in 53 cases, transitional cell carcinoma in 6, and adenoid cystic epithelioma of the undersurface of the tongue in 1.

Under carcinoma of the tonsils and pharynx are included 11 pharyngeal, 10 tonsillar, and 5 faucial tumors. Transitional cell carcinoma was diagnosed in 8 cases, acanthoma in 17, and adenoid cystic epithelioma of the pharynx in 1.

Carcinoma of salivary and lacrimal glands included 8 parotid tumors, 3 submaxillary, 1 each of face, pharynx and lacrimal glands, and 3 salivary gland tumors; 2 were classed as carcinoma, 8 as transitional cell epithelioma, 4 as adenocarcinoma, 1 as adenocarcinoma with chondrosarcomatous stroma, and 2 as adenoacanthoma (of the submaxillary and lacrimal glands, respectively).

Of 17 acanthomas and 1 adenocarcinoma of the esophagus, 4 were cervical, 6 thoracic, 6 at the cardia, and 2 of the esophagus.

Stomach carcinomas were diffuse in 4 cases, not located in 30, in the antrum and pylorus in 55, in the fundus, greater or lesser curvature, or anterior or posterior wall in 22, and cardia in 12; 8 cases were classed as fibrosing or scirrhous carcinoma, 10 as fibrosing or scirrhous adenocarcinoma, 12 as mucous carcinoma or adenocarcinoma, 6 as papillary adenocarcinoma, 19 as carcinoma, 62 as adenocarcinoma, 3 as carcinoma arising in chronic peptic ulcer, 2 as pyloric adenoacanthoma and 1 as acanthoma of the greater curvature.

TABLE 8.—*Known locations and types of gastric carcinoma in white seamen and landsmen, percentage incidence*

	Antrum and pylorus	Fundus and curvatures	Cardia	Mucous and scirrhous
White seamen	54	28	17	20
White landsmen	73	14	5	38

Intestinal carcinomas arose in the duodenum in 5 cases, jejunum and ileum in 4, cecum and ascending colon in 16, flexures, transverse and descending colon in 11, sigmoid in 22, rectum in 63, colon in 20, and intestine in 1. Carcinoma was diagnosed in 10 cases, adenoma malignum in 13, adenocarcinoma in 52, papillary adenocarcinoma in 26, mucous carcinoma in 2, mucous adenocarcinoma in 24, papillary mucous adenocarcinoma in 5, mucoscirrhous carcinoma in 1, scirrhous and fibrocarcinoma and fibro-adenocarcinoma in 9. There were also 8 acanthomas of the anus.

In white seamen 40 percent of intestinal tumors were adenocarcinomas and 18 percent mucous carcinomas; in landsmen these percentages were 28 and 26 percent, respectively.

Appendicial tumors were classed as adenocarcinoma in 2 cases, carcinoma in 1, adenocarcinomyoma in 1, lipoid-bearing carcinoid in 7, and lipoid-free carcinoid in 5.

Gall bladder and duct adenocarcinomas were intrahepatic in 4 cases and involved the common duct in 5 and the gall bladder in 10.

Of 16 cases of hepatoma, 1 was associated with hemochromatosis (*5*) and 13 with hepatic cirrhosis.

Carcinoma of the pancreas involved the head in 14 cases, the body in 3, the tail in 1, head and body in 2, and body and tail in 1. It was diffuse in 3 cases and not specifically located in 3. The type was duct adenocarcinoma in 17, mucous adenocarcinoma in 1, carcinoma in 7, and scirrhous carcinoma in 2.

The varieties of adamantinoma encountered were plexiform epithelioma in 2 cases, glandular in 1, mixed plexiform epithelioma and acanthoma in 2, mixed plexiform epithelioma and glandular in 1, and mixed acanthoma and grandular in 1.

Salivary mixed tumors were found in the parotid in 28 cases, submaxillary in 13, neck in 8, palate, fauces, and jaw in 5, nose and upper lip in 6, and in the 2 the location was not given. Histologic elements present in 69 specimens from 62 salivary mixed tumors are shown in table 9. In 3 cases definite carcinoma formed part of the tissue in an original, a second, and a third operative specimen, respectively.

TABLE 9.—*Histologic elements present in 69 specimens from 62 cases of salivary mixed tumor*

Number of specimens	Tubules	Masses of fusiform epithelial cells	Myxoma	Cartilage	Fibrous tissue	Bone
39	+	+	+	+	−	−
12	+	+	+	−	−	−
6	+	+	+	−	+	−
4	−	+	+	−	−	−
2	−	+	+	−	+	−
1	−	+	+	−	−	+
1	+	+	+	+	−	+
1	+	+	+	−	−	+
1	+	+	+	+	+	−
1	+	−	+	+	−	−
1	+	[1]+	+	+	−	−
69	62	68	69	43	9	3

[1] Grading into typical prickle cells

Gastrointestinal angioendotheliomas were located in the lip in 4 cases, cheek in 2, and palate, gum, and anus in 1 each.

Among the lung cancers were 36 cases of solid carcinoma originally diagnosed variously as carcinoma, transitional cell carcinoma or epithelioma, spindle cell, columnar cell, or cylindrical cell carcinoma, 15 cases of adenocarcinoma diagnosed as papillary, mucous, or unqualified adenocarcinoma, and 9 cases of acanthoma or mixed acanthoma and transitional cell carcinoma. The right lung was involved in 29 cases, the left in 15. Tumors were median or bilateral in 9, and in 7 location was unknown.

Thyroid cancers included 6 cases of the so-called adenoma malignum, 3 of adenocarcinoma (1 toxic), 1 of papillary cystadenocarcinoma, 1 of scirrhous adenocarcinoma, 1 of von Getzowa's struma, 3 of carcinoma, 1 of transitional cell epithelioma, and 1 of Hürthle cell carcinoma. The last 5 were fatal.

Two thymic tumors were transitional cell epithelioma.

Cases classed as transitional cell epithelioma in cervical lymph nodes included 57 cases on original examination. Sources were later determined as lung in 4, tonsil in 2, buccal mucosa in 3, thyroid in 1, testis in 1, lip in 2, pharynx in 3, and undetermined in 20 cases. Of the last, 3 cases were possibly branchiogenic in origin.

Laryngeal carcinoma was classed as acanthoma in 11 cases, as transitional cell epithelioma in 5, as carcinoma in 2, as basal cell epithelioma

in 1, and at biopsy as transitional cell epithelioma and at autopsy as acanthoma in 1.

Nasal and paranasal sinus tumors were classed as transitional cell or cylindrical cell carcinoma in 11 cases, as mixed transitional cell epithelioma and acanthoma in 1, as acanthoma in 1, as basal cell epithelioma in 1, and as adenoid cystic epithelioma in 1. Both of the last were in the maxillary sinus. These sinuses gave rise to 4 other tumors, the sphenoid and ethmoid area to 1, the nasal passages to 3, and the nasopharynx to 5.

Carcinoma of the testis involved the right testis in 32 cases, the left in 15, and in 1 the location was not recorded. The type was embryonal carcinoma in 18 cases, 1 with coincident teratoma; embryonal adenocarcinoma in 14 (4 with teratoma); embryonal carcinoma with lymphoid stroma in 4; papillary adenocarcinoma in 4; chorionepithelioma in 2; mixed embryonal carcinoma, chorionepithelioma, and teratoma in 1; and spindle cell sarcoma in 1.

Two further cases of apparently benign teratoma of the testis and 2 of the ovary were diagnosed. Two mediastinal teratomas and 1 predominantly neural teratoma of the nasal region were encountered

The retroperitoneal tumors included an apparently benign teratoma, a teratoma with a metastasizing embryonal carcinoma, a fibroblastic sarcoma, a rhabdomyoma, and 7 embryonal carcinomas.

Carcinoma of the cervix uteri was classed as carcinoma or transitional cell or spindle cell epithelioma in 23 cases and as acanthoma in 15. The two types showed no significant variation in frequency with race. Corpus carcinoma was classed in 5 cases as adenocarcinoma and in 1 each as carcinoma, papillary adenocarcinoma, and chorionepithelioma. There were 2 ovarian carcinomas and 4 papillary adenocarcinomas.

Bladder carcinomas were diagnosed as carcinoma in 4 cases, spindle cell carcinoma in 2, adenocarcinoma in 2, transitional cell epithelioma in 11, papillary epithelioma in 21, and acanthoma in 3. Tumors were papillary in 13 of 21 white seamen and in 6 of 17 white landsmen.

Carcinomas of the renal pelvis were diagnosed as papillary epithelioma in 4 cases and transitional cell epithelioma in 1. Renal carcinomas were classed as embryonal carcinoma in 1 case and as adenocarcinoma in 27. Of the latter, 13 showed papillary structure, 19 were of clear cell type, 3 granular cell, and 5 mixed or undesignated as to cell type. In 10 cases renal tumors of clear cells without tubular structure were designated as hypernephroma. Other renal and adrenal tumors included 1 case of neuroblastoma of the adrenal, 1 of renal adenomyosarcoma, 1 of renal leiomyosarcomatosis, and 1 of renal leiomyoliposarcoma.

The diagnosis and race and sex distribution of breast cancers are shown in table 10.

TABLE 10.—*Breast cancers by diagnosis, sex, and race*

	White males	White females	Negro females	Indian females	Total	Known dead	Known living
Carcinoma	0	10	0	5	15		
Duct carcinoma	0	2	0	1	3	7	5
Mucous carcinoma	0	0	1	0	1		
Scirrhous carcinoma	1	11	2	0	14	4	4
Adenocarcinoma	3	11	2	2	18		
Duct adenocarcinoma	0	3	0	1	4	7	11
Comedo carcinoma	1	1	0	0	2		
Adenoacanthoma sarcomatodes [1]	0	1	0	0	1		
Total	5	39	5	9	58		

[1] See ref. 7.

One patient had 3 independent acanthomas of axilla, hand, and scrotum, 3 had 2 independent acanthomas as follows: face and right ear, neck and nose, neck and face. The total of 144 tumors in 139 patients was distributed as follows: face 68, neck 12, trunk 2, genitals 8, arm, forearm, and shoulder 4, wrist 4, hand 25, lower extremity 12, unknown 5, and 4 petrifying epitheliomas in subcutaneous cysts of the arm, forearm, neck, and flank. There appears to be a significant difference in location of the tumors in white seamen and white landsmen. The former show 85 percent of the tumors on the face, neck, and hands, while in the landsmen only 69 percent of the acanthomas are in these exposed areas. The deck force (60 tumors) showed a slightly higher concentration of tumors on these exposed parts (87 percent) than other seamen, and of the 42 landsmen, 21 outdoor workers had only 67 percent of tumors in exposed areas, a slightly lower rate than for all landsmen. It would appear that outdoor exposure is not particularly significant in this group.

In a further effort to determine the cause of the increased proportional incidence in white seamen of cutaneous acanthoma on exposed parts of the body, the cases were segregated according to the geographic location of the hospitals furnishing the material (table 11).

TABLE 11.—*Geographic origin of cases of cutaneous acanthoma and relation to anatomical sites*

	North Atlantic	South Atlantic and Gulf	Pacific	Total, salt water	Great Lakes	Inland	Total, fresh water	North of 37° N.	South of 37° N.	Total
Exposed parts:										
Number	32	22	13	67	9	30	39	41	65	106
Percent	84.2	81.5	100	85.9	75	60	62.9	75.9	75.6	75.7
Covered parts:										
Number	6	4	0	10	3	16	19	13	16	29
Percent	15.8	14.8	0	12.8	25	32	30.6	24.1	18.6	20.7
Unknown:										
Number	0	1	0	1	0	4	4	0	5	5
Percent	0	3.7	0	1.3	0	8	6.5	0	5.8	3.6
Total										
Number	38	27	13	78	12	50	62	54	86	140
Percent	100	100	100	100	100	100	100	100	100	100

It appears from this table that cases originating in salt-water ports show 86 percent of the cutaneous acanthomas on the exposed areas, as compared with 63 percent in cases originating in fresh-water ports and inland points. Latitude per se seems of little importance. When the white males only are considered and further separated into seamen and landsmen, the groups of seamen from Great Lakes and inland ports and of landsmen from salt-water ports are probably too small to give significant figures; we are thus not able to decide whether the occupational or the geographic factor is the more important. The fact that outdoor landsmen and deck seamen show no greater concentration of acanthomas on exposed areas inclines us to the view that the geographic factor is the more important.

Multiple basal cell tumors were present in 4 cases; 1 seaman had at different times basal cell tumors of the face and leg, an acanthoma of the hand, and an adenoid cystic epithelioma of the back; 3 seamen had 2 basal cell tumors at the same time, face and neck, cheek and ear, right and left cheeks. Another seaman had a basal cell tumor of the cheek and an acanthoma adenoides cysticum of the buttock, another a similar adenoid cystic tumor of the face in 1929 and a basal cell tumor of the nose in 1931. The 149 basal cell tumors in the 145 patients were distributed as follows: scalp, forehead, and eyebrow, 15; eyelids, 15; temple and ear, 22; cheeks, 23; nose, 18; face, 17; neck, 16; trunk, 7; perineum, 2; arm and hand, 4; leg and foot, 3, and unknown, 7. Again the white seamen present a higher proportional incidence of tumors on the exposed areas of the body (93 percent compared with 82 percent in white landsmen). Segregation as with the acanthomas according to the geographic location of the hospital submitting the material gave no significant difference between salt-water ports on the one hand, and lake and inland points on the other. Points north of 37° N. gave a higher proportionate incidence of basal cell tumors on the exposed areas in both white seamen (98 percent) and landsmen (86 percent) than did points south of 37° N. (87 and 76 percent). When white males were divided into 4 groups—outdoor and indoor landsmen, deck department, and combined stewards, and engine force for seamen—indoor landsmen showed 78 percent of the tumors on exposed areas as compared with about 90 percent in the other 3 groups. However, the groups are small and no definite conclusions can be drawn.

Adenoid and adenoid cystic epitheliomas of the skin were located on the eyebrow and lid, forehead, and scalp in 9 cases, nose in 4, cheek and face in 12, temple and ear in 4, head in 1, neck in 4, hand in 2, trunk in 3, and the location was unknown in 1 case.

Basal cell and adenoid tumors were specifically diagnosed as cylindroma in 142 cases, adenoid cystic epithelioma of Brooke in 27, between cylindroma and the Brooke type in 4, acanthoma adenoides

cysticum of Unna in 6, between cylindroma and the Unna type in 1, epithelioma adenoides in 5, between cylindroma and epithelioma adenoides in 1, acanthoma adenoides (of Unna type, but noncystic) in 1, and between cylindroma and acanthoma in 2 cases.

Adnexal cutaneous tumors included 4 adenomata sebacea of the nose, lip, and face (2), 2 sweat gland carcinomas of the nose and scrotum, 1 sweat gland adenocarcinoma of unknown location, 2 sweat gland adenoacanthomas of temple and scalp, a papillary cystadenoma sudoriporum of the chest, a teratoid papillary adenoepitheliomyxofibroma of the scalp, and an aberrant paraganglion of the temple.

Six primary cutaneous naevomelanomas were located on the head and neck, 10 on the trunk, 6 on the upper extremity, 9 on the lower extremity, and the location of 7 was unknown.

Cutaneous xanthomas and giant cell tumors were found in 3 cases on the eyelids, in 3 on the elbows, forearms, and hands, in 15 on buttocks, thighs, legs, and feet, in 1 on the abdomen, and in 1 case the location was unknown. In 5 cases the tumors were multiple.

Angioendothelioma and angiosarcoma cutis were located on the face in 1 case, scalp in 3, shoulder in 3, upper extremity in 4, lower extremity in 4 and in 1 case the location was unknown. Diagnoses were hemorrhagic sarcoma in 4 cases, angioendothelioma in 9, fibroangioendothelioma in 1, and multiple angiofibrochondroma in 1.

Sarcoma and fibrosarcoma cutis comprised 31 tumors in 30 cases, located on the face in 1, ear in 1, neck in 3, trunk in 6, upper extremity in 5, lower extremity in 13, and in 2 the location was unknown; 16 were fibrosarcomas, 13 fibroblastic.

Solitary neurofibromas and neurofibrosarcomas cutis were located on the head in 6 cases, trunk in 11, upper extremity in 12, lower in 8, and in unknown location in 7. The diagnosis was neurofibrosarcoma in 17 cases, neurofibroma in 27.

For comparison with the locations of the cutaneous tumors just mentioned, table 12 is presented to give the locations of the benign cutaneous tumors studied during the same period.

In bone sarcoma, the primary tumors involved the jaws in 6 cases, vertebrae in 2, ribs in 3, scapula and ulna in 1 each, pelvis in 5, femur and knee joint in 5, tibia in 5, toes in 2, and in 1 there was an osteochondrofibrosarcoma metastatic in the lungs with no record of the primary site. Five cases were periosteal fibroblastic and fibrosarcomas, 7 were osteoplastic fibroblastic sarcomas of which 3 were noted as subperiosteal, 5 were osteochondrosarcomas, 5 were chondrosarcomas, 4 myxochondromas, and 3 myxosarcomas. Two medullary tumors were, respectively, chondrosarcoma of a distal phalanx of a toe and osteosarcoma originating in a cyst in the femur and metastasizing to liver and lungs; the latter was an autopsy case with multiple bone cysts in humerus and skull as well.

TABLE 12.—*Distribution of 486 benign cutaneous tumors*

	Benign naevi					Verrucae					Fibromas						Angiomas				Keloids			
	White seamen	White landsmen	White females	Other	All	White seamen	White landsmen	White females	Other	All	White seamen	White landsmen	White females	Negro males	Other	All	White seamen	White landsmen	Other	All	White males	Negro males	All males	Total
Head	16	13	5	6	40	20	15	9	6	50	1	2	1	0	2	6	2	3	2	7	1	1	2	105
Neck	1	1	1	0	3	3	6	0	1	10	6	0	0	0	1	7	0	2	1	3	1	2	4	27
Trunk	8	5	10	3	26	19	16	2	2	39	9	4	2	4	3	22	4	8	2	14	2	1	3	104
Upper	1	3	2	0	6	21	10	4	4	39	8	3	2	0	1	14	5	2	3	10	1	1	2	71
Lower	3	2	1	3	9	6	11	2	4	23	7	3	2	3	3	18	4	7	1	12	0	0	0	62
Unknown	16	16	10	7	49	5	10	5	12	32	7	4	2	3	5	21	5	5	4	14	0	1	1	117
Total	45	40	29	19	133	74	68	22	29	193	38	16	9	10	15	88	20	27	13	60	5	6	12	486
Multiple	---	---	---	---	---	4	1	---	---	5	---	--	---	---	---	---	---	3	1	4	---	---	---	9

Muscle and fascial sarcoma included 13 cases with fibroblastic spindle cell structure, 2 mixed fibroblastic and fibrosarcomas, 6 fibrosarcomas, 3 myxomas, 1 myxofibroma, 5 myxofibroblastic and myxosarcomas, 1 myxofibrosarcoma, and 2 myxolipofibroblastic sarcomas. Primary tumors involved the orbit in 1 case, lower extremity in 17, trunk in 8, upper extremity in 2, neck in 1, spermatic cord in 1, and in 3 the location was uncertain.

Sarcomas of deep nerve trunks arose on cranial nerves or in the head in 5 cases, phrenic nerve or neck in 4, upper extremity or specified nerves therein in 10, lower in 9, trunk in 2, and were identified only in visceral or bony metastases in 2 cases. Histologically, 18 cases were classed as neurofibrosarcoma, 4 as neurilemmoma, 1 as endothelioma, 9 as neurofibroma. There were 2 cases of deep angioendothelioma, 1 involving the radial nerve and fatal 1 year later, the other causing rupture of the extensor tendon of the thumb.

Tumors diagnosed as mesothelioma arose in the pleura in 3 cases, peritoneum in 2, and pericardium in 1. Four were composed largely of spindle cells, 1 was quite desmoplastic, and 1 showed tubular structure.

Giant cell tumors of tendons and aponeuroses were found in fingers in 19 cases, palm and wrist in 7, knee in 4, foot in 2, occiput in 1, and in an amputation stump bursa in 1. Structure was chiefly xanthomatous in 12 cases, partly in 7, and not xanthomatous in 15.

Giant cell tumors of bone arose in the femur in 2 cases, tibia in 3, and radius in 1.

Benign bony and cartilaginous tumors comprised 10 chondromas, 30 osteomas and osteochondromas, and 1 cementoma; 6 were located in skull and jaws, 7 in upper extremity, 5 in ribs and pelvis, 8 in the femur, 9 in the tibia and fibula, 2 in the foot, and in 5 cases location was unknown.

Two muscular and fascial fibromas occurred in the neck, 5 in back

and buttocks, 6 in the upper extremity, 3 in the lower extremity, and 2 in the omentum.

Among fascial tumors were 4 cases with leiomyoma arising apparently from the muscle layers of an increased number of small arteries; 3 of these tumors were found in the thigh, 1 in the upper lip. Perhaps these tumors should be designated as arterial angiomyoma of the deep fascia.

Lipomas from 303 cases were examined. Multiple tumors were present in 36 cases. Locations were known in 275: head 30, neck 33, trunk 122, upper extremity 56, lower 28, miscellaneous 6. In white seamen, 30.7 percent of the lipomas were on the head, neck, and hands; in white landsmen only 14.0 percent. Geographic location of the hospitals from which these tumors were received had no influence on their topographic distribution. (Compare with the cutaneous acanthomas.)

Table 13 gives the detailed classification of the 145 cases with lymphatic tumors.

TABLE 13.—*Diagnoses of lymphatic tumors, average ages, sex, race, and occupation of patients, and known deaths*

Diagnosis	White seamen			White landsmen			Others			Total			
	Number	Average age	Number dead	Number	Average age	Number dead	Number	Average age	Number dead	Number	Average age	Number dead	Percent dead
Fibrosing Hodgkin's	8 (4)	------	6 (3)	5 (2)	------	3 (2)	1	------	0	14	34.7	9 (5)	64
Cellular Hodgkin's	22 (7)	------	14 (6)	15 (3)	------	8 (3)	3	------	1	40	37.8	23 (9)	57
Hodgkin's and reticulum cell sarcomas	7 (3)	------	5 (3)	9 (1)	------	9 (1)	1	------	1	17	43.2	15 (4)	88
Monocytic leukemia	0	------	0	1	------	1	0	------	0	1	45	1	0
Total	30	38.9	19	27	39.8	18	4	33.7	2	61	38.8	39	64
Lymphoma	3	------	0	0	------	0	----	------	0	3	25.0	0	0
Follicular lymphocytoma	2	------	1	0	------	0	----	------	0	2	33.5	1	50
Follicular lymphosarcoma	5	------	0	2	------	1	1	51	1	8	47.9	2	25
Aleukemic lymphocytoma	3	------	1	5	------	4	4	------	3	12	49.3	8	67
Leukemic lymphocytoma	4	------	3	2	------	2	2	------	2	8	46.0	7	87
Lymphosarcoma	13	------	8	9	------	4	4	------	1	26	41.7	13	50
Leukemic lymphosarcoma	2	------	1	1	------	0	1	------	1	4	46.7	2	50
Total	32	41.1	14	19	47.2	11	12	44.4	8	63	43.5	33	52
Plasma cell myeloma	2	------	2	3	------	2	1	22	1	6	52.5	5	83
Myeloblastic myeloma	4	------	4	3	------	3	----	------	----	7	39.3	7	100
Myelocytic pseudoleukemia	1	------	1	1	------	1	----	------	----	2	26.5	2	100
Myelocytic leukemia	4	------	4	2	------	2	----	------	----	6	44.3	6	100
Total	11	44.7	11	9	44.3	8	1	22	1	21	43.5	20	95
Grand total	73	41.7	44	55	43.2	37	17	39.7	11	145	41.5	92	63

NOTE.—The figures in parentheses indicate the number of cases under each category that are also included in other categories.

This group is conspicuous for the diagnostic difficulties involved, and on many of the earlier cases in this group, restudy was deemed necessary on account of changes in concepts and classification of

these conditions. Following this study not only were some cases reclassified but some were rejected entirely as follows:

No. 5950, diagnosed lymphoma, rejected as hypertrophic lymphadenitis. No. 4165 diagnosed lymphosarcoma, rejected as subacute hyperplastic lymphadenitis. No. 5444 diagnosed lymphosarcoma, rejected as lymphogranuloma inguinale. No. 5640 diagnosed Hodgkin's, rejected as subacute pyogenic lymphadenitis. No. 5479 diagnosed Hodgkin's (inguinal), rejected as lymphogranuloma inguinale. No. 26024 diagnosed as Hodgkin's and tuberculosis, rejected as lymphogranuloma inguinale. No. 301291 diagnosed as probable early Hodgkin's, rejected as subacute lymphadenitis. No. S–2377, diagnosed as lymphadenitis with eosinophilia, possibility of Hodgkin's left open, finally rejected with diagnosis of pernicious anemia. Nos. S–2980 and A–773, diagnosis in dispute between lymphosarcoma of follicular lymphoblastic or reticulum cell type and hyperplastic lymphadenitis, considered finally subacute mesenteric thrombosis with abdominal lymphadenitis. No. A–901, diagnosed as granulomatous mediastinal Hodgkin's and fibrosing tuberculosis, rejected as fibrosing tuberculosis.

Nos. 26020 and 27388, first reported as reticulum cell lymphosarcoma, finally excluded as metastatic (cervical) transitional cell carcinoma. No. 27236, endothelioma of lymph node, reclassified as metastatic carcinoma (cervical) Nos. 27371 and 27384, first regarded as reticulum cell sarcoma of tonsil with subcutaneous metastasis, excluded as transitional cell carcinoma. Nos. S–1222 and A–605, diagnosed reticulum cell sarcoma over an original impression of metastatic carcinoma, now regarded as metastatic unpigmented naevocarcinoma. No. 29502, hyperplastic lymphadenitis with question of lymphosarcoma, disposed of as syphilis. No. A–788, diagnosis much disputed, classed as mediastinal Hodgkin's sarcoma, rejected as thymic carcinoma. No. S–1801, diagnosed as cutaneous metastatic reticulum cell sarcoma or carcinoma, finally resolved as embryonal carcinoma of testis. No. S–7675, diagnosis lymphoblastic lymphosarcoma or bronchogenic carcinoma, decided as the latter.

In ocular melanosarcoma, iris was the source in 1 case, chorioid in 11. Right and left eyes were involved with equal frequency.

Meningioma was called variously meningioma, angiosarcoma, and angioendothelioma. Locations were left frontal, parietal and temporal, cerebellar, and 2 spinal.

Of the cerebral gliomas, 10 tumors originated in cerebral cortex; 2 frontal, 5 postcentral and parietal, 2 temporal and 1 not designated; 1 originated in the corpus callosum; 1 bilateral tumor in the corona radiata of the parieto-occipital areas extending from the tail of the caudate nucleus to the calcarine cortex; 2 originated in internal capsule; 3 in the cerebellum and 1 in the pons; 9 cases were diagnosed

as spongioblastoma multiforme, 1 spongioblastoma unipolare, 2 spongioblastoma bipolare, 2 astrocytoma, 1 astrocytoma fibrillare, 1 neurocytoma, 1 pinealoma, and 1 as glioma.

In addition to the foregoing, there was found a papilloma of the chorioid plexus in the posterior horn of the left lateral ventricle of a 7-month-old white female infant who died of pertussis pneumonia.

CARCINOMA OF UNCERTAIN SOURCE

After every effort to assign a proper site of origin to tumors, there remained a residue of 62 cases, 26 in white seamen, 25 in landsmen, 3 in white females, 6 in Negro males, 1 each in Negro and Indian females, and 1 in a male of unknown race. The sites of these tumors, mode of diagnosis, and type of tumor are shown in table 14.

It is noteworthy that in most of the cases in which complete autopsy was performed, the case was general carcinosis in which no decision could be reached as to the primary source of the tumor. In 3 of the bone tumors, clinical diagnoses of sarcoma were made and either no autopsies were done or they were incomplete; 1 case of adenocarcinoma of femur and acetabulum was subjected to complete autopsy and no primary source could be demonstrated. However, no histologic material was obtained from thyroid or testis. In the 2 fairly complete autopsies in which carcinoma of the liver was found, the gross diagnoses were primary carcinoma, but the tumors histologically appeared to be metastatic tumors.

TABLE 14.—*Tumors of undetermined origin*

Site of tumor	Diagnosed at			Type of tumor					Total
	Biopsy	Partial autopsy	Complete autopsy	Carcinoma	Adenocarcinoma	Mucous carcinoma	Scirrhous carcinoma	Acanthoma	
Liver	9	2	2	11	2	----	----	----	13
Omentum, peritoneum	6	----	----	----	3	3	----	----	6
Cervical lymph node	10	----	----	4	3	0	2	1	10
Axillary lymph node	3	----	----	3	----	----	----	----	3
Inguinal lymph node	3	----	----	1	1	----	1	----	3
Chest and abdominal wall	2	----	----	----	1	1	----	----	2
Subcutis	4	----	----	2	1	----	1	----	4
Bones	7	4	1	8	2	2	0	0	12
General carcinosis	1	----	7	4	3	0	1	0	8
Other and not known	----	1	1	----	1	----	----	1	2
Total	45	7	11	33	17	6	5	2	63

SUMMARY

There is reported an analysis of 2,066 malignant and 1,222 benign tumors studied histologically by the writer. Differences in type and location of various tumors according to sex, race, age, and occupation are pointed out. The series includes a high proportion of white male seafaring patients, and this group is specially considered. A small

series of tumors from American Indians is also included and discussed. Differences in behavior of histologic varieties of many tumors of specified locations are discussed briefly.

REFERENCES

(*1*) Ewing, J.: Neoplastic Diseases. 3d ed., Saunders, Philadelphia, 1928.
(*2*) Dorn, H. F.: The incidence of cancer in Cook County, Illinois, 1937. Pub. Health Rep., **55**: 628–650 (1940).
(*3*) Mountin, J. W., Dorn, H. F., and Boone, B. R.: The incidence of cancer in Atlanta, Georgia, and surrounding counties. Pub. Health Rep., **54**: 1255–1273 (1939).
(*4*) Gover, Mary: Cancer mortality in the United States. I. Trend of recorded cancer mortality in the death registration States of 1900 from 1900 to 1935. Pub. Health Bull. No. 248, Government Printing Office, Washington, 1939.
(*5*) Binford, C. H., Lawrence, R. L., and Wollenweber, H. L.: Hemochromatosis with primary carcinoma of the liver. Arch. Path., **25**: 527–533 (1938).
(*6*) Lillie, R. D., Cox, O. H., and Teufel, W. C.: Multiple branchiogenic acanthoma. Am. J. Path., **10**: 97–99 (1934).
(*7*) Pasternack, J. G., and Wirth, J. E.: Adenoacanthoma sarcomatodes of the mammary gland. Am. J. Path., **12**: 423–434 (1936).
(*8*) Callender, G. R.: Tumors and tumor-like conditions of the lymphocyte, the myelocyte and the reticulum cell. Am. J. Path., **10**: 443–465 (1934).
(*9*) Quinland, W. S., and Cuff, J. R. Primary carcinoma in the Negro. Arch. Path., **30**: 393–402 (1940).

DEATHS DURING WEEK ENDED NOVEMBER 15, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 15, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,276	8,093
Average for 3 prior years	8,210	
Total deaths, first 46 weeks of year	384,048	384,988
Deaths per 1,000 population, first 46 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	553	506
Average for 3 prior years	409	
Deaths under 1 year of age, first 46 weeks of year	24,360	23,091
Data from industrial insurance companies:		
Policies in force	64,642,665	64,855,143
Number of death claims	9,699	10,110
Death claims per 1,000 policies in force, annual rate	7.8	8.2
Death claims per 1,000 policies, first 46 weeks of year, annual rate	9.4	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 22, 1941

Summary

A total of 158 cases of poliomyelitis was reported for the current week, as compared with 174 for the preceding week and with a 5-year (1936–40) median of 114 for the corresponding week. The following named 3 States reported 15 or more cases (last week's figures in parentheses): Tennessee 28 (29); Pennsylvania 16 (8); and New York 15 (28). The persistence of the disease in these States has been largely responsible for the continued incidence above the normal seasonal expectancy. Only 5 other States reported more than 4 cases (Alabama 9, Ohio, Michigan, and Minnesota 8 each, and Illinois 5).

The number of reported cases of influenza was slightly above that for last week—2,469 as compared with 2,372. The 5-year median expectancy for the week is 1,161. More than one-half of the current cases were reported from Texas—1,295 as compared with 1,085 for the preceding week. South Carolina reported 291 cases, Virginia 157, Arkansas 128, Oklahoma 113, and Arizona 105. The highest incidence is shown for the southern and western States. Only 93 cases were reported in the New England, Atlantic, and North Central States.

No unusual incidence of any of the other common communicable diseases was reported. A delayed report of 1 case of psittacosis occurring in New York during October was received. Of 50 cases of endemic typhus fever, 25 occurred in Georgia.

The crude death rate for the current week in 88 large cities of the United States is 11.7 per 1,000 population, as compared with 11.6 last week and with 11.2 for the 3-year (1938–40) average.

Telegraphic morbidity reports from State health officers for the week ended November 22, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940	
NEW ENG.												
Maine	0	1	3	------	------	1	142	64	37	0	1	0
New Hampshire	1	0	0	2	------	------	17	3	3	0	0	0
Vermont	0	0	1	------	------	------	1	12	12	0	0	0
Massachusetts	5	1	4	------	------	------	108	264	143	3	1	1
Rhode Island	4	1	1	------	------	------	3	0	4	0	0	0
Connecticut	0	0	2	------	4	4	65	4	30	1	2	0
MID. ATL.												
New York	14	13	20	[1] 7	[1] 1	[1] 13	136	493	129	7	0	5
New Jersey	2	10	10	4	3	7	15	183	28	1	2	1
Pennsylvania	12	16	38	------	------	------	332	972	62	3	2	2
E. NO. CEN.												
Ohio	22	10	36	6	25	9	28	35	18	1	0	1
Indiana	13	17	25	32	7	8	17	21	11	0	1	1
Illinois	30	19	39	6	3	12	30	356	18	4	0	1
Michigan [2]	7	12	16	1	---	1	50	348	93	0	2	2
Wisconsin	5	1	3	17	21	23	157	262	10	0	0	0
W. NO. CEN.												
Minnesota	0	1	6	1	------	------	10	59	59	0	0	0
Iowa	7	4	4	1	4	3	18	33	13	0	0	1
Missouri	10	4	22	12	3	14	13	5	5	0	2	2
North Dakota	0	3	1	------	9	8	18	0	4	0	0	0
South Dakota	1	0	1	------	------	------	1	0	2	0	0	0
Nebraska	7	0	2	------	------	------	5	2	2	0	0	0
Kansas	6	5	10	1	1	2	66	15	15	0	1	1
SO. ATL.												
Delaware	1	4	0	------	------	------	1	3	3	0	0	0
Maryland [2]	29	3	10	4	5	5	52	4	6	0	1	1
Dist. of Col.	0	1	6	------	1	------	2	3	3	0	0	0
Virginia	51	24	57	157	123	105	102	48	23	0	2	2
West Virginia	10	8	13	13	16	16	76	14	14	0	0	2
North Carolina [3]	60	27	69	5	5	5	165	8	132	1	1	1
South Carolina [3]	23	10	12	291	157	274	8	2	6	0	0	0
Georgia [3]	21	18	21	59	16	15	21	5	3	1	0	1
Florida [3]	8	9	9	------	2	7	9	2	3	0	0	0
E. SO. CEN.												
Kentucky	17	10	16	3	10	10	36	144	11	0	1	1
Tennessee [3]	31	16	21	31	14	40	37	13	13	1	1	2
Alabama [3]	39	12	34	66	52	52	9	11	10	0	0	2
Mississippi [2] [3]	15	4	20	------	------	------	------	------	------	1	0	1
W. SO. CEN.												
Arkansas	29	23	17	128	62	46	66	3	3	1	0	0
Louisiana [3]	7	8	20	11	6	6	2	0	1	0	1	1
Oklahoma	18	7	13	113	38	47	24	2	2	0	0	0
Texas [3]	76	17	49	1,295	104	209	112	2	9	2	1	1
MOUNTAIN												
Montana	4	3	2	7	5	5	26	4	14	0	0	0
Idaho	6	0	0	8	------	------	6	0	26	0	0	1
Wyoming	0	0	0	2	1	------	0	0	1	0	0	0
Colorado	13	6	6	17	11	9	108	26	21	0	1	1
New Mexico	4	0	4	------	4	1	19	14	14	0	0	0
Arizona	4	3	5	105	117	87	29	30	13	0	0	0
Utah [2]	2	0	1	7	12	7	25	2	15	1	0	0
Nevada	1	0	------	------	------	------	3	0	------	0	0	------
PACIFIC												
Washington	1	3	3	------	1	------	10	11	11	0	0	0
Oregon	1	2	1	9	18	21	25	23	9	0	0	0
California [3]	25	17	26	45	471	33	259	63	63	1	1	1
Total	642	355	789	2,469	1,332	1,161	2,464	3,568	2,221	29	24	37
47 weeks	14,547	13,930	24,507	584,478	179,196	162,712	847,884	248,828	277,005	1,827	1,521	2,626

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 22, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940		Nov. 22, 1941	Nov. 23, 1940	
NEW ENG.												
Maine	2	0	0	17	9	13	0	0	0	0	0	1
New Hampshire	2	0	0	14	0	4	0	0	0	0	0	0
Vermont	0	0	0	7	11	9	0	0	0	0	0	0
Massachusetts	4	0	0	170	119	105	0	0	0	2	3	1
Rhode Island	0	0	0	14	3	7	0	0	0	0	0	0
Connecticut	2	1	1	20	29	39	0	0	0	2	5	2
MID. ATL.												
New York	15	3	4	216	141	246	0	0	0	6	6	7
New Jersey	3	1	1	86	72	72	0	0	0	1	5	2
Pennsylvania	16	4	4	210	187	218	0	0	0	7	9	14
E. NO. CEN.												
Ohio	8	16	2	137	130	242	1	0	0	9	2	2
Indiana	4	10	0	105	72	124	1	0	3	2	0	3
Illinois	5	26	3	160	242	306	2	4	1	3	3	6
Michigan [2]	8	13	2	115	112	274	1	9	3	1	2	3
Wisconsin	3	18	1	111	108	165	0	2	7	1	0	1
W. NO. CEN.												
Minnesota	8	11	2	50	70	102	1	6	11	0	0	0
Iowa	0	6	3	33	99	92	1	0	2	2	1	1
Missouri	3	5	4	80	49	81	1	0	4	4	2	6
North Dakota	0	1	1	3	11	23	0	0	16	0	0	0
South Dakota	1	0	0	33	24	26	0	0	1	0	0	0
Nebraska	0	6	2	16	7	20	0	1	0	1	0	0
Kansas	2	2	1	70	89	119	1	0	1	1	3	3
SO. ATL.												
Delaware	0	0	0	15	7	7	0	0	0	2	0	0
Maryland [3]	4	1	0	43	36	36	0	0	0	2	2	3
Dist. of Col.	1	0	0	14	8	11	0	0	0	0	0	0
Virginia	2	9	0	68	55	55	0	0	0	6	6	6
West Virginia	0	18	1	68	44	88	1	0	0	5	1	5
North Carolina [3]	3	2	1	89	78	78	0	0	0	1	8	8
South Carolina [3]	0	0	0	10	10	11	1	0	0	1	0	0
Georgia [3]	1	0	0	49	35	34	1	0	0	5	5	9
Florida [3]	2	0	0	7	3	6	0	0	0	1	4	0
E. SO. CEN.												
Kentucky	3	4	2	85	79	70	0	0	0	6	4	4
Tennessee [3]	28	3	2	125	98	70	0	1	0	11	3	4
Alabama [3]	9	1	2	51	35	31	0	0	0	0	2	3
Mississippi [2] [3]	4	0	1	21	18	17	0	0	0	4	2	2
W. SO. CEN.												
Arkansas	1	0	2	11	18	18	0	1	1	13	10	7
Louisiana [3]	0	0	0	7	8	12	0	0	0	3	5	5
Oklahoma	1	1	1	23	12	27	0	0	4	4	5	8
Texas [3]	1	1	1	93	16	68	0	0	2	6	0	20
MOUNTAIN												
Montana	1	1	0	28	24	31	1	1	1	0	0	0
Idaho	2	1	0	1	11	15	0	0	1	0	4	3
Wyoming	0	2	0	5	5	5	0	0	0	0	0	0
Colorado	1	2	2	25	31	31	0	0	3	4	2	2
New Mexico	0	0	0	7	6	18	0	0	0	7	5	4
Arizona	1	0	0	2	8	8	0	0	0	1	1	1
Utah [2]	0	1	1	8	12	17	0	1	0	0	3	1
Nevada	0	0		1	0		0	0		0	0	
PACIFIC												
Washington	1	1	1	21	13	32	0	0	8	1	3	2
Oregon	3	3	0	4	25	27	0	0	3	0	2	2
California [3]	3	5	11	94	78	169	1	0	2	1	9	7
Total	158	179	114	2,642	2,357	3,363	14	26	109	126	127	194
47 weeks	8,693	9,379	6,911	112,628	140,753	167,502	1,278	2,202	9,122	7,954	9,038	13,597

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 22, 1941, and comparison with corresponding week of 1940—Continued.

Division and State	Whooping cough, Week ended— Nov. 22, 1941	Whooping cough, Week ended— Nov. 23, 1940
NEW ENG.		
Maine	23	29
New Hampshire	0	10
Vermont	12	10
Massachusetts	134	266
Rhode Island	35	5
Connecticut	73	115
MID. ATL.		
New York	474	465
New Jersey	226	147
Pennsylvania	223	649
E. NO. CEN.		
Ohio	235	289
Indiana	41	26
Illinois	237	130
Michigan [2]	279	322
Wisconsin	338	134
W. NO. CEN.		
Minnesota	56	119
Iowa	26	20
Missouri	21	99
North Dakota	9	9
South Dakota	3	4
Nebraska	9	8
Kansas	87	116
SO. ATL.		
Delaware	2	38
Maryland [2]	27	89
District of Columbia	14	9
Virginia	51	86
West Virginia	9	29
North Carolina [3]	102	176
South Carolina [3]	22	33
SO. ATL.—continued		
Georgia [3]	15	18
Florida [3]	9	6
E. SO. CEN.		
Kentucky	124	67
Tennessee [3]	26	51
Alabama [3]	30	13
Mississippi [2] [3]		
W. SO. CEN.		
Arkansas	15	7
Louisiana [3]	3	4
Oklahoma	18	15
Texas [3]	102	37
MOUNTAIN		
Montana	27	5
Idaho	2	6
Wyoming	9	1
Colorado	42	17
New Mexico	25	20
Arizona	10	2
Utah [2]	20	21
Nevada	9	0
PACIFIC		
Washington	116	11
Oregon	33	10
California [3]	152	323
Total	3,555	4,093
47 weeks	191,173	150,970

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Nov. 22, 1941, 50 cases as follows: North Carolina, 3; South Carolina, 3; Georgia, 25; Florida, 2; Tennessee, 2; Alabama, 5; Mississippi, 2; Louisiana, 1; Texas, 6; California, 1.

WEEKLY REPORTS FROM CITIES

City reports for week ended November 8, 1941

This table lists the reports from 131 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	2	4	0	1	0	5	24
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	0	11
Nashua	0	------	0	0	0	5	0	0	0	11	8
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	2	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	1	0	0	4
Massachusetts:											
Boston	0	------	0	5	8	42	0	10	1	37	205
Fall River	1	------	0	0	1	16	0	1	0	2	33
Springfield	0	------	0	9	1	11	0	0	0	15	23
Worcester	0	------	0	1	10	0	0	0	0	4	52
Rhode Island:											
Pawtucket	0	------	------	1	------	0	0	------	0	0	------
Providence	8	------	0	5	3	5	0	2	0	18	52
Connecticut:											
Bridgeport	0	1	0	2	3	1	0	2	0	0	28
Hartford	0	------	0	1	6	5	0	0	0	3	43
New Haven	0	------	0	27	0	1	0	0	0	3	23
New York:											
Buffalo	0	------	1	0	7	10	0	7	0	21	140
New York	23	2	2	8	55	68	0	67	2	230	1,439
Rochester	0	------	0	0	3	2	0	2	0	6	69
Syracuse	0	------	0	0	2	1	0	0	0	20	38
New Jersey:											
Camden	0	------	0	0	1	5	0	0	0	3	34
Newark	0	6	1	4	6	13	0	5	0	51	94
Trenton	0	------	0	0	2	5	0	1	0	1	35
Pennsylvania:											
Philadelphia	0	------	1	3	19	37	0	12	1	72	439
Pittsburgh	1	1	1	1	10	22	0	6	1	31	156
Reading	0	------	0	1	0	0	0	0	0	6	21
Scranton	0	------	------	0	------	0	0	------	0	0	------
Ohio:											
Cincinnati	0	2	1	0	6	10	0	2	1	11	98
Cleveland	1	11	0	1	9	11	0	10	2	37	191
Columbus	0	------	0	1	4	7	0	1	0	8	82
Toledo	1	------	0	2	1	2	0	5	1	9	78
Indiana:											
Anderson	0	------	0	0	2	0	0	0	0	0	7
Indianapolis	3	------	1	2	9	15	0	1	1	21	120
Muncie	0	------	0	0	2	0	0	1	0	0	15
South Bend	0	------	0	0	0	0	0	0	0	0	10
Terre Haute	1	------	0	0	2	0	0	0	0	0	17
Illinois:											
Alton	1	------	0	0	3	0	0	0	0	0	9
Chicago	13	9	2	26	25	63	0	33	0	104	662
Elgin	0	------	0	0	1	0	0	0	0	5	11
Springfield	0	------	0	1	3	1	1	0	0	0	29
Michigan:											
Detroit	2	------	0	10	11	62	0	10	0	48	284
Flint	1	------	0	0	2	1	0	0	0	1	35
Grand Rapids	0	------	0	2	2	0	0	0	0	6	40
Wisconsin:											
Kenosha	0	------	0	0	0	0	0	0	0	3	13
Madison	0	------	0	2	0	2	0	0	0	5	11
Milwaukee	0	------	0	2	5	25	0	3	0	112	94
Racine	0	------	0	2	0	2	0	0	0	16	18
Superior	0	------	0	2	0	0	0	0	0	10	6
Minnesota:											
Duluth	0	------	0	0	0	5	0	0	0	11	20
Minneapolis	1	------	0	1	2	3	0	0	0	13	93
St. Paul	0	------	0	0	4	8	0	1	0	22	47
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	0	------
Davenport	1	------	------	0	------	1	0	------	0	0	------
Des Moines	0	------	0	0	0	5	0	0	0	0	40
Sioux City	0	------	------	0	------	0	0	------	0	0	------
Waterloo	0	------	------	0	------	4	0	------	0	0	------

City reports for week ended November 8, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis cases	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0		1	1	7	14	0	4	0	2	79
St. Joseph	0		0	3	3	2	0	0	0	0	23
St. Louis	4	8	2	0	8	17	0	6	0	5	172
North Dakota:											
Fargo	0		0	0	0	0	0	0	0	0	7
Grand Forks	0			0		0	0		0	0	
Minot	0		0	4	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	0			1		2	0		0	13	
Nebraska:											
Lincoln	0			1		0	0		0	0	
Omaha	0		0	0	2	3	0	1	0	0	52
Kansas:											
Lawrence	0		0	0	1	0	0	0	0	0	5
Topeka	0	4	0	1	0	2	0	0	0	4	15
Wichita	0		0	0	1	2	0	1	0	6	34
Delaware:											
Wilmington	0		0	1	2	0	0	0	0	0	43
Maryland:											
Baltimore	4		0	24	11	18	0	8	1	34	240
Cumberland	0		0	0	0	0	0	0	0	1	12
Frederick	0		0	0	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	0	2	1	1	7	13	0	6	0	6	154
Virginia:											
Lynchburg	0		0	0	4	0	0	0	1	4	11
Norfolk	1		0	0	4	0	0	0	0	0	26
Richmond	3		1	1	2	4	0	1	0	0	47
Roanoke	0		0	0	2	0	0	0	1	1	25
West Virginia:											
Charleston	2		0	0	5	1	0	0	0	3	33
Huntington	0			0		0	0		0	0	
Wheeling	1		0	8	1	1	0	0	0	2	18
North Carolina:											
Gastonia	0			0		0	0		0	0	
Wilmington	5		0	27	1	0	0	2	0	2	18
Winston-Salem	5		0	53	0	0	0	1	0	1	8
South Carolina:											
Charleston	0	4	0	0	1	0	0	1	2	0	23
Florence	0		0	0	0	0	0	0	0	0	13
Greenville	0		0	0	0	0	0	0	0	2	10
Georgia:											
Atlanta	1	7	1	0	3	13	0	2	2	0	74
Brunswick	0		0	0	0	0	0	0	0	0	2
Savannah	0		0	2	1	0	0	0	0	0	29
Florida:											
Miami	0		0	2	2	0	0	2	1	4	32
St. Petersburg	0		0	0	0	0	0	1	0	0	22
Tampa	0		0	0	1	0	0	1	0	2	15
Kentucky:											
Ashland	0		0	0	0	0	0	1	0	0	5
Covington	0		0	0	0	2	0	2	0	2	12
Lexington	0		0	0	1	0	0	0	0	1	14
Louisville	0	2	0	0	4	16	0	1	0	10	76
Tennessee:											
Knoxville	0		0	0	0	2	0	0	0	0	31
Memphis	1		0	0	2	7	0	4	0	7	69
Nashville	1		0	0	3	7	0	0	0	7	52
Alabama:											
Birmingham	2		1	0	0	5	0	4	0	3	65
Mobile	2		2	0	0	0	0	4	0	0	32
Montgomery	1			0		0	0		0	1	
Arkansas:											
Fort Smith	1			0		0	0		1	0	
Little Rock	0	8	0	0	0	1	0	1	0	0	28
Louisiana:											
Lake Charles	0		0	0	0	1	0	0	0	0	5
New Orleans	1	9	0	0	11	0	0	8	2	6	128
Shreveport	0		0	0	2	2	0	0	1	0	29
Oklahoma:											
Oklahoma City	2	4	0	0	9	3	0	1	0	1	58
Tulsa	3		1	22	3	3	0	0	0	0	10
Texas:											
Dallas	3	1	1	4	2	5	0	2	1	2	65
Fort Worth	1		0	0	2	1	0	1	0	2	37
Galveston	1		0	0	0	1	0	0	0	0	18
Houston	1		0	2	4	1	0	2	0	8	84
San Antonio	2	7	0	1	0	5	0	0	0	0	68

City reports for week ended November 8, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
Montana:											
Billings	0		0	0	1	0	0	0	0	0	9
Great Falls	0		0	2	1	7	0	0	0	8	9
Helena	0		0	1	0	6	0	0	0	2	3
Missoula	0		0	0	1	0	0	0	0	0	6
Colorado:											
Colorado Springs	0		0	1	1	2	0	1	0	5	9
Denver	9	15	1	6	5	4	0	3	1	26	72
Pueblo	0		0	58	3	3	0	0	0	2	8
New Mexico:											
Albuquerque	0		0	0	1	0	0	0	0	2	5
Arizona:											
Phoenix	2	25		0		1	0		0	1	
Utah:											
Salt Lake City	0		0	2	2	2		0	0	11	29
Washington:											
Seattle	0		0	0	0	8	0	3	0	25	102
Spokane	0		0	0	2	8	0	0	0	3	34
Tacoma	0		0	0	1	3	0	1	0	2	20
Oregon:											
Portland	2	1	1	0	2	3	0	0	0	6	99
Salem	0			0		0	0		0	0	
California:											
Los Angeles	0	21	0	14	10	21	0	20	0	16	342
Sacramento	2	1	0	2	0	1	0	1	0	1	33
San Francisco	0		0	6	1	4	0	4	1	2	157

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Vermont:			
Burlington	0	0	1
Massachusetts:			
Boston	1	0	1
New York:			
Buffalo	0	0	1
New York	2	0	14
Rochester	0	0	5
Syracuse	0	0	3
New Jersey:			
Newark	0	0	1
Trenton	0	0	1
Pennsylvania:			
Philadelphia	0	0	3
Pittsburgh	1	0	0
Ohio:			
Cincinnati	0	0	1
Toledo	0	0	1
Indiana:			
Terre Haute	0	0	1
Illinois:			
Chicago	1	0	12
Michigan:			
Detroit	0	0	2
Grand Rapids	0	0	1
Minnesota:			
Duluth	0	0	2
Minneapolis	0	0	1
St. Paul	0	0	1
Maryland:			
Baltimore	2	0	0
District of Columbia:			
Washington	0	0	2
Virginia:			
Lynchburg	0	0	1
Richmond	1	0	0
North Carolina:			
Wilmington	0	0	1
Kentucky:			
Louisville	0	0	1
Tennessee:			
Memphis	0	0	2
Alabama:			
Birmingham	0	0	1
Texas:			
San Antonio	0	0	1
Washington:			
Seattle	0	0	2
California:			
Los Angeles	0	0	1

Dengue.—Cases: Charleston, S. C., 1.
Encephalitis, epidemic or lethargic.—Cases: Birmingham, 1. Deaths: Nashua, 1; New York, 2.
Pellagra.—Cases: Charleston, S. C., 4; Savannah, 2; Miami, 1; Birmingham, 2.
Typhus fever.—Cases: New York, 3; Norfolk, 2; Charleston, S. C., 1; Atlanta, 1; Savannah, 2; Miami, 1; Birmingham, 1; Montgomery, 1; Galveston, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population, 1940, 33,380,672)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Nov. 8, 1941	15.46	17.62	3.25	52.86	52.08	99.07	0.15	41.42	3.40	177.74
Average for week, 1936-40	23.90	14.53	4.53	96.22	66.54	118.72	0.62	49.05	5.47	164.33

TERRITORIES AND POSSESSIONS

PANAMA CANAL ZONE

Communicable diseases—July–September 1941.—During the months of July, August, and September 1941, certain communicable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	July		August		September	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	3		1		3	
Diphtheria	17		20	2	11	
Dysentery (amoebic)	12		6		4	1
Dysentery (bacillary)	6	6			4	4
Leprosy	3			1	1	2
Lethargic encephalitis	1	1				
Malaria	322	7	260	4	[illegible]	9
Measles	100		143		139	
Meningitis, meningococcus			1	1		
Mumps	4		2		3	
Paratyphoid fever	8		2			
Pneumonia	[1] 19	33	[1] 25	35	[1] 29	36
Poliomyelitis	1					
Smallpox (alastrim)					[2] 1	
Tuberculosis	[1] 10	26	[1] 4	26	[1] 3	31
Typhoid fever	1		3		4	1
Whooping cough	[1] 4		[1] 3	4	[1] 2	1

[1] In the Canal Zone only.
[2] In Panama.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended October 18, 1941.—During the week ended October 18, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		2	1	1	2	3	1		2	12
Chickenpox		8		107	211	32	48	5	48	454
Diphtheria		22	1	53	5	8	1			85
Dysentery				3						3
Influenza		40			7	1	10		22	80
Lethargic encephalitis				1			[1] 13			14
Measles				107	61	1	6		5	180
Mumps				212	76	17	23	1	71	400
Pneumonia		4			3		2		5	14
Poliomyelitis		1	12		6	3	2	2	1	27
Scarlet fever		10	9	137	157	18	11	19	5	366
Trachoma									17	17
Tuberculosis	1	12	6	97	55	2	18			191
Typhoid and paratyphoid fever			1	22	4	1	9		2	39
Whooping cough				141	94		8		31	274

[1] Encephalomyelitis.

JAMAICA

Communicable diseases—4 weeks ended October 25, 1941.—During the 4 weeks ended October 25, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	2	3	Scarlet fever		2
Diphtheria		3	Tuberculosis	28	55
Dysentery	4	3	Typhoid fever	11	55
Leprosy	1	6			

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January-August 1941	September 1941	October 1941—week ended— 4	11	18	25
ASIA							
Ceylon	C	1	1				
China:							
Canton	C	437	27				
Hong Kong	C	1,547	88	11			
Macao	C	875	307	83	70	40	36
Shanghai	C	486	245	38	23	13	7
India	C	64,013	7,689				
Bombay	C	15					
Calcutta	C	1,868	40	41			
Rangoon	C	115					
India (French)	C	34					
Japan: Taiwan	C	2					

World Distribution of Cholera, Plague, Smallpox, Typhus Fever, and Yellow Fever—Continued

PLAGUE

[C indicates cases]

Place	January-August 1941	September 1941	October 1941—week ended— 4	11	18	25
AFRICA						
Belgian Congo C	[1] 28					
British East Africa:						
Kenya C	288	43				
Uganda C	70	9				
Egypt: Port Said C	8					
Madagascar C	202	5				[2] 22
Morocco C	2,006	59		16	19	7
Casablanca.[3]						
Tunisia: Tunis C	2					
Union of South Africa C	68					
ASIA						
China: Foochow C	3					
Dutch East Indies:						
Java and Madura C	416					
West Java C	397					
India C	3,363					
Calcutta C	3					
Rangoon C	9					
Indochina (French) C	20	3			2	
Palestine: Haifa C	2	3				
Plague-infected rats	10					
Thailand: Lampang Province C	1	1				
EUROPE						
Portugal: Azores Islands C	1					
NORTH AMERICA						
Canada—Alberta—Plague-infected ground squirrel	1					
SOUTH AMERICA						
Argentina:						
Cordoba Province C	[4] 21					
Santa Fe Province—Plague-infected rats	67					
Brazil: Bahia State[5] C	4					
Chile: Valparaiso.[6]						
Ecuador C	33					
Peru:						
Ancash Department C	1					
Lambayeque Department C	2	1				
Libertad Department C	6	1				
Lima Department C	8	2				
Moquegua Department—Ilo C	7					
Piura Department C	2					
OCEANIA						
Hawaii Territory:[7] Plague-infected rats	48	4	1			
New Caledonia C	9					

[1] Includes 21 cases of pneumonic plague.
[2] For the month of October.
[3] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco, where several deaths had been reported.
[4] Includes 3 cases of pneumonic plague.
[5] A report dated Oct. 15, 1941, stated that several cases of plague had occurred in the interior of the State of Bahia, Brazil.
[6] A report dated October 13 stated that 1 case of plague had occurred in Valparaiso, Chile.
[7] During April and May, 4 lots of plague-infected fleas were reported in Hawaii Territory, and for the week ended Nov. 1, one plague-infected rat was reported in Kapulena area, Hamakua District, Island of Hawaii.

World Distribution of Cholera, Plague, Smallpox, Typhus Fever, and Yellow Fever—Continued

SMALLPOX

[C indicates cases]

Place		January-August 1941	September 1941	October 1941—week ended— 4	11	18	25
AFRICA							
Algeria	C	311	83				[1] 71
Angola	C	[2] 29					
Belgian Congo	C	634					
British East Africa	C	30					
Dahomey	C	464	2				
French Guinea	C	45					
Ivory Coast	C	39					
Morocco	C	155					
Nigeria	C	732	13				
Niger Territory	C	264	1				
Portuguese East Africa	C	9					
Rhodesia: Southern	C	86					
Senegal	C	59					
Sierra Leone	C	15					
Sudan (Anglo-Egyptian)	C	7					
Sudan (French)	C	19					
Union of South Africa	C	370					
ASIA							
Ceylon	C	114					
China	C	251	1			3	1
Chosen	C	696					
Dutch East Indies—Bali Island	C	3					
India	C	21,226	918				
India (French)	C	9					
India (Portuguese)	C	70					
Indochina (French)	C	938	96				[1] 55
Iran	C	8					
Iraq	C	1,060	122				
Japan	C	200					
Straits Settlements	C	1					
Syria	C	1					
Thailand	C	234	13				
EUROPE							
France	C	1					
Portugal	C	35	2		1		
Spain	C	239	55	7	14	12	
NORTH AMERICA							
Canada	C	24			1		
Dominican Republic	C	2					
Guatemala	C	5					
Mexico	C	37					
Panama Canal Zone (alastrim)	C		1				
SOUTH AMERICA							
Bolivia	C	[3] 18					
Brazil	C	1					
Colombia	C	581	6				
Paraguay	C	[3] 8					
Peru	C	778					
Uruguay	C	7					
Venezuela (alastrim)	C	181	26			9	

[1] For October.
[2] For June.
[3] For January, February, and March.

World Distribution of Cholera, Plague, Smallpox, Typhus Fever, and Yellow Fever—Continued

TYPHUS FEVER

[C indicates cases]

Place		January–August 1941	September 1941	October 1941—week ended— 4	11	18	25
AFRICA							
Algeria	C	9,541	216				[1] 227
British East Africa: Kenya	C	4	1				
Egypt	C	4,551					
Morocco	C	858	26		4	6	8
Sierra Leone	C	5					
Tunisia	C	4,793	165	26	39	46	
Union of South Africa	C	274					
ASIA							
China	C	212	2				
Chosen	C	425					
Dutch East Indies: Sumatra	C	135					
Iran	C	106					
Iraq	C	41					
Japan	C	861					
Malaya: Unfederated States	C	1					
Palestine	C	41					
Straits Settlements	C	6					
Trans-Jordan	C	6					
EUROPE							
Bulgaria	C	222	2		2		1
France (unoccupied zone)	C	[2] 2					
Germany	C	1,331	147	11	23	15	
Gibraltar	C	2					
Greece	C	7					
Hungary	C	370	38	15	10		
Irish Free State	C	26					
Poland	C	705	3				
Portugal	C	5					
Rumania	C	731	29	15	5	5	6
Spain	C	8,906	172	25	25	21	
Switzerland	C	5					
Turkey	C	623					
Yugoslavia	C	78					
NORTH AMERICA							
Guatemala	C	145	12				
Mexico	C	113	14		4	2	
Panama Canal Zone	C	3					
Puerto Rico	C	[4] 3	1		3		1
SOUTH AMERICA							
Bolivia	C	[4] 75					
Brazil	C	1					
Chile	C	125	5				
Colombia	C	[2] 1					
Ecuador	C	95	24				
Peru	C	1,079					
Venezuela	C	38	4				
OCEANIA							
Australia	C	13					
Hawaii Territory	C	20	14	3	2	2	6

[1] For October.
[2] For June.
[3] For July.
[4] For January, February, and March.

World Distribution of Cholera, Plague, Smallpox, Typhus Fever, and Yellow Fever—Continued

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January-August 1941	September 1941	October 1941—week ended— 4	11	18	25
AFRICA							
Belgian Congo:							
Kimvulu	C	1					
Libenge	C	1					
Stanleyville.[1]							
British East Africa: Uganda.[2]							
French Equatorial Africa:							
Gabon	C	2					
Mayumba	C	4					
French Guinea.[3]							
Gold Coast: Accra	C	1					
Ivory Coast	C	[4] 5			1		
Nigeria	C	[5] 1					
Spanish Guinea	D	4					
Sudan (French).[6]							
SOUTH AMERICA[7]							
Brazil:							
Amazonas State	D	3					
Bahia State	D	2					
Para State	D	5	1				
Colombia:							
Antioquia Department	D	2					
Boyaca Department	D	8					
Intendencia of Meta	D	5	3				
Santander Department	D	12	2				
Tolima Department	D	1					
Peru: Junin Department	C	5					
Venezuela: Bolivar State	C	[8] 1					

[1] For the week ended Nov. 1, 1 death from suspected yellow fever was reported in Stanleyville, Belgian Congo.
[2] A report dated Sept. 9 stated that 1 case of yellow fever was reported in Uganda, British East Africa.
[3] Yellow fever was reported in French Guinea as follows: Week ended Nov. 1, 1 case; week ended Nov. 8, 1 case; week ended Nov. 15, 1 suspected case.
[4] Includes 2 suspected cases.
[5] Suspected.
[6] Yellow fever was reported in French Sudan as follows: Week ended Nov. 1, 5 cases, including 2 suspected cases; week ended Nov. 8, 1 suspected case.
[7] All yellow fever reported in South America is of the jungle type unless otherwise specified.
[8] For the month of August.

X

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

150th Anniversary of the Bill of Rights

December 15, 1941

Freedom of Speech
Freedom of Press
Freedom of Religion
Freedom of Assembly
Equal Justice to All

A Noble Heritage and a Sacred Trust

The American Bill of Rights was ratified on December 15, 1791. The Sesquicentennial Anniversary is celebrated throughout the Nation in accordance with a Joint Resolution of Congress and a Proclamation of the President.

Public Health Reports

VOLUME 56 **DECEMBER 5, 1941** NUMBER 49

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56 • DECEMBER 5, 1941 • *No. 49*

FACILITIES IN THE UNITED STATES FOR THE SPECIAL CARE OF CHILDREN WITH RHEUMATIC HEART DISEASE [1]

By O. F. Hedley, *Surgeon, United States Public Health Service*

During the past several years there has been an awakening of interest in rheumatic heart disease, which is now becoming widely recognized as one of the major public health problems confronting this country. It is, therefore, desirable to determine what facilities for treatment are available, their adequacy, and the need and direction for expansion.

At the outset it should be emphasized that institutional care represents a compromise solution. It is not, and probably never will be, the ideal form of treatment. Barring the discovery of a chemotherapeutic substance capable of inactivating rheumatic infection, or the discovery of a satisfactory method of immunization, treatment will perforce be dependent in a large measure on prolonged rest in bed, the results of which are admittedly often disappointing. Often rheumatic infection runs a fulminating course, severe and irreparable damage developing in a short time. Nevertheless, since the considered care of the child with rheumatic heart disease or potential rheumatic heart disease forms the keystone of efforts to prevent or ameliorate serious heart damage, it seems desirable to find out how this may better be accomplished, frankly recognizing the inherent limitations.

SPECIAL INSTITUTIONS IN THE UNITED STATES FOR THE TREATMENT OF RHEUMATIC HEART DISEASE

Acccording to Swift [2] there are less than a thousand beds devoted exclusively to the care of rheumatic heart disease patients in the United States. Of these, about 300 beds are located in institutions in Greater New York (*1*). Owing to the exigencies of war, it has not been possible to ascertain the number of beds devoted to this purpose in Great Britain. London alone had approximately 900 beds set aside for prolonged hospital and convalescent care of children with rheumatic heart disease (*2*). A comprehensive program for the management of rheumatic heart infection in children was begun in

[1] From the Division of Infectious Diseases, National Institute of Health. Submitted for publication in November 1940.

[2] Swift, Homer F.: Personal communication.

1926 and was apparently beginning to bear fruit at the outbreak of hostilities. The rheumatism control scheme of the London County Council included the establishment of 20 rheumatism supervisory centers which were special clinics for diagnosis and periodic supervision. According to the Annual Report of the Council (*3*), the incidence of heart disease among London school children declined from 2.0 percent to 0.8 percent during the 10-year period 1926–36. That the decline was as great as indicated should be accepted with reservations. It may have been that, with increased experience, criteria for diagnosing organic cardiac lesions were made more rigid (*4, 5*).

There were in the United States at the beginning of 1940 one rheumatic heart disease hospital, seven convalescent institutions of various types devoted exclusively to the treatment of children with heart disease, and one organization with a unit furnishing foster home care to children recovering from rheumatic infection. One of the convalescent sanatoriums is adding facilities for the care of essentially hospital cases. Since the beginning of 1940 at least two other rheumatic heart disease sanatoriums have been opened, while beginning in the fall of 1940 a general convalescent institution in Florida was to be devoted entirely to the treatment of rheumatic heart disease.

There are a number of convalescent sanatoriums which furnish care to rheumatic cardiac patients. Although some of them have wards set aside for these patients, in many instances they do not furnish care on a large scale. In most places, additional beds allocated to this purpose would be sufficient.

RHEUMATIC HEART DISEASE HOSPITAL

House of the Good Samaritan, Boston, Mass.—This institution, which has been devoted exclusively to the treatment of rheumatic heart disease since 1921, is the only rheumatic heart disease hospital in the United States.

The House of the Good Samaritan occupies a three-story, brick building valued at $375,000. It is located in close proximity to the Harvard Medical School. The building is adequate for the number of patients treated but could be greatly expanded before absorbing the potential load. The hospital is divided into small wards of not more than six beds each. Ample facilities are provided for the isolation of patients with colds and other intercurrent diseases, and seriously ill patients.

The medical staff consists of a full-time research director, a research pathologist and several research assistants, a resident physician, four house officers, four visiting physicians, two assistant visiting physicians, and a consulting staff of ten physicians. The nursing staff consists of trained nurses who are assisted by practical nurses.

There are also a number of bacteriologists, technicians, and custodial and clerical personnel. A full-time social service worker is employed and the part-time services of several social workers at the Massachusetts General Hospital are utilized.

The House of the Good Samaritan has a capacity of 80 beds and treats about 175 patients a year. Over 1,800 cases have been treated since 1921. It has an out-patient clinic as part of its treatment and follow-up service. Some former patients are periodically observed at the Massachusetts General Hospital. The success of these follow-up measures is due largely to the social service department which could serve as a model for other institutions.

The House of the Good Samaritan is a private institution controlled by a board of trustees. Its income is derived from private contributions, research grants, and endowments. Its budget is approximately $100,000, of which approximately $70,000 is devoted to the care of patients, and about $30,000 to research. The average cost per capita per diem is $2.65, exclusive of the amount spent for research.

This institution does not as a rule accept cases during their first attacks; rather it takes subacute cases and furnishes prolonged hospital care, including a certain amount of convalescent care. Cases of rheumatic fever with or without heart disease and cases of active rheumatic heart disease with relatively good prognosis are accepted. Once a patient has been admitted, he may be readmitted regardless of his subsequent condition, with certain restrictions as to age.

Both male and female patients are admitted. Boys are admitted regularly up to 12 years of age. There are four beds available for male patients over 12 years. Girls and women of any age are admitted. Until a few years ago all patients were admitted free. A maximum charge of $10 a week now is made to patients who can afford to pay. No private patients are accepted. A certain number of patients are sent in from parts of Massachusetts other than Boston. Their expenses are met by local welfare agencies.

The average duration of hospitalization is about 4 months. Patients are accepted from clinics and homes. Prehospitalization in a general hospital is not required. A previous tonsillectomy is not necessary for admission. A good general diet, rich in calcium, proteins, and vitamins is supplied. Cod-liver oil is furnished routinely. During the winter, patients are given increasing doses of ultraviolet rays.

The House of the Good Samaritan has been responsible for more research studies on rheumatic fever than any other place in the country. Because of a splendid follow-up system, it has been able to make valuable contributions to the treatment and prognosis of this disease over a number of years. Since 1932, approximately 40 scientific articles have been published. A wide range of studies have

been conducted in its well-equipped laboratories. One of its most valuable contributions is that it serves as a sort of clearinghouse for information regarding the clinical aspects of this disease. It has also been extremely useful as a training center for young physicians.

CARDIAC CONVALESCENT SANATORIUMS

Saint Francis Sanatorium for Cardiac Children, Mineola, Long Island, N. Y.—Although this institution is at present a convalescent sanatorium, upon completion of its building program it will be a rheumatic heart disease hospital and sanatorium.

This institution was established many years ago as a summer camp for underprivileged children, operated by the Sisters of the Franciscan Order of Mary. Since 1937 it has been used exclusively for the care of children with rheumatic heart disease.

The building, which is valued at $100,000, is comfortable and attractive, and is located in the suburbs on a 15-acre tract valued at $100,000. Additions have been made to the original building to provide for space for laboratories. The sicker children are kept on the first floor and those in better condition on the second floor. There is no elevator service, but this is not regarded as a matter of great importance since cardiac insufficiency in children is due primarily to infection rather than to physical exertion.

The sanatorium has a capacity of 50 beds. Over 300 children have been admitted. At the present time, admission is restricted to girls aged 6 to 12 years. Children with potential heart disease and Classes I and II (new classification) (*6*) rheumatic heart disease are accepted. The average stay is about 7 months. Cases are admitted directly from homes and clinics, as well as from hospitals. Acute cases are not accepted, but cases developing moderate rheumatic activity are retained. Very sick children occasionally have to be sent back to hospitals in the metropolitan area.

Ten beds are devoted to isolation purposes. On admission, each patient is isolated for 7 days. Acute communicable diseases have not, however, been an important problem. Tonsillectomy is not required before admission.

The New York City Board of Education supplies two teachers. Practically all of the children continue their school work without falling behind. Occupational therapy is carried on by the Sisters.

One of the most noticeable features of this sanatorium is that it is almost devoid of an institutional atmosphere; patients appear to be enjoying life under pleasant surroundings. The rooms do not look like wards. During the winter months, indoor games and story-telling are provided; in summer, the children spend most of their time out of doors, in bed, or on the playground. Motion pictures are shown once a week.

The sanatorium receives $1.40 per day for each child from New York City. This sum, together with gifts from private sources, is sufficient with careful management to meet expenses, since many of the vegetables and fruits used are raised on the premises, and nursing care is provided by the Sisters. It is estimated that the total cost per patient per diem is about $2.65.

Follow-up relations are maintained with former patients admitted from Kings County Hospital in Brooklyn. Home visits are made by social workers every 6 weeks as long as is indicated. By alternating the visits of social workers with attendance on clinics, former patients are seen every 3 weeks. It is not considered feasible to follow patients admitted from Manhattan.

The full-time staff consists of one resident physician. There are four visiting physicians and one visiting dentist. The staff is adequate for general convalescent care but does not provide for an extension of research. Ten of the Sisters are graduate nurses and seven are practical nurses. Three have had graduate work in bacteriology at Columbia University. There is one volunteer social worker.

Three single-story, brick pavilions are under construction, each to have a bed capacity of 25. This will enable the institution to care for boys, older girls, and cases of acute rheumatic disease. Saint Francis Sanatorium for Cardiac Children is destined to become one of the largest institutions of this kind in the United States. It will be the only "all-purpose" institution. Persons interested in establishing treatment centers for rheumatic heart disease should personally observe the work that is being done at this sanatorium.

Irvington House, Irvington-on-Hudson, N. Y.—This institution was established in 1920. The present building, opened in 1932, has a capacity of 150 beds but owing to financial stringencies not more than 105 are occupied.

Irvington House is located on a knoll about 500 feet high on the east bank of the Hudson River about 20 miles north of the center of New York City. The building is of modified Georgian colonial architecture, four stories high, in the shape of a letter H, and is adequate for use either as a convalescent institution or as a hospital. In addition to the wards, it contains ample laboratory facilities, quarters, a recreation room, dining room, and service rooms. The land is valued at $100,000, the building and equipment at $650,000.

Five wards of 24 beds each are in use; 3 of these are divided into cubicles. In addition there are 19 beds in rooms devoted to isolation purposes. This has proved adequate. Newcomers and patients with upper respiratory infections and other communicable diseases are routinely isolated.

Irvington House is a private institution under a board of directors. Its income for 1938 was $117,000, of which approximately $45,000 was

from private contributions, and \$58,000 from the city of New York and Westchester County for the care of patients at a per capita per diem rate of \$1.40. The institution also received a grant of over \$7,000 for research, and small sums from a modest endowment and other sources. Disbursements amounted to approximately \$115,000, of which \$21,000 was for physical maintenance, \$46,000 for institutional administration, \$22,000 for the New York office, \$4,000 for vocational guidance, \$7,500 for research, and \$1,000 for dental equipment. The per capita per diem cost was \$2.00 in 1937, exclusive of research, vocational guidance, and after-care, but including plant upkeep.

The medical personnel consists of two full-time physicians who supervise treatment and conduct research, two visiting physicians, and two consultants There is one visiting dentist. The nursing staff consists of 12 trained nurses. Twelve recreational teachers are provided. Four teachers are assigned by New York City.

Children of both sexes 7 to 15 years of age are accepted. Admissions are limited to patients who have had rheumatic fever or chorea, and who offer reasonably good prognoses. Cases with a limited degree of rheumatic heart disease are accepted. Applications are made through the New York Heart Association by the chief of a recognized heart clinic. Prehospitalization is not required since patients are isolated for about a week on admission. Tonsillectomy is not required. No private cases are accepted and all treatment is free of charge.

At the present time, each patient is treated there for at least 2 years; some, however, are permitted to go home during the summer. No cases are admitted from December 1 to May 1, in order to prevent the admission of cases of active rheumatic infection.

Numerous research studies are conducted on the etiology of rheumatic fever, heart sounds, methodology of treatment, and the cause of recurrences. The laboratory is well equipped. As part of its research program, the Irvington House maintains a clinic in New York City and examines former patients once a year. Treatment of former patients is done by the referring clinic. This extensive follow-up service requires three full-time social workers.

Adequate recreational facilities, including motion pictures once a week, are provided. With clinical improvement, patients are allowed greater physical activity. A very interesting system of self-government, based on the Seton Thompson system, has been worked out. Patients wear uniforms and receive merit badges for good behavior and physical improvement. This does much to maintain morale and to instill principles of social responsibility.

Despite its splendid physical equipment, it is doubtful whether Irvington House will serve as a model for other convalescent sanatoriums. The cost of the building is approximately \$4,000 per bed,

based on a capacity of 150 beds. One of its chief drawbacks is its relative inaccessibility, which makes it difficult for parents to visit their children. This prevents its use as a hospital for acutely ill patients. Irvington House, however, is one of the best institutions of this kind in the United States and should be studied, not with a view of duplicating it, but of obtaining many helpful suggestions.

Pelham House, Pelham Manor, N. Y.—Pelham House, established in 1914, is the oldest cardiac convalescent institution in the United States. It is owned by the Pelham Heart Association, a private organization, which raises funds for its support; no municipal or State aid is received. It is located near Bronxville, N. Y., about 15 miles from the Columbia-Presbyterian Medical Center with which it is affiliated. The building, which was originally a dwelling house, is of frame construction. Recently a schoolroom and a sun porch have been added. The estimated value of the building is about $35,000.

Girls aged 5 to 12 years are admitted. Patients are accepted with a greater degree of cardiac damage than is the case in most convalescent institutions. A general policy is made of filling the institution to capacity in the fall and not discharging patients during the winter. Most of the cases are admitted from and followed by the clinics of the Presbyterian Hospital. Some have been observed for as long as 15 years.

The medical personnel consists of three attending physicians; the nursing staff of two trained nurses. A teacher, who also serves as recreational supervisor, is furnished by New York City.

Pelham House is run on a very economical basis. Care is adequate but plain. The per capita per diem cost is slightly over $1. It has a capacity of 30 beds, and serves as a model of what may be accomplished on a modest scale.

Although not equipped for research on an extensive scale, throat cultures and blood specimens are obtained and sent to the Presbyterian Hospital for study. Investigations are also being conducted on the influence of sulfanilamide in preventing recurrences of activity of rheumatic infection (7).

Martine Farm, White Plains, N. Y.—This institution was established in 1921, and consists of a large farm house on a tract of 45 acres. It has a capacity of 25 beds. It is financed largely by private philanthropy with some State and municipal assistance. Since much of the food is raised on the farm, it is impossible to determine the per diem cost of maintaining patients.

Boys and girls aged 6 to 16 are treated. The average stay is about 6 months. Children are accepted from a number of clinics and hospitals. Prehospitalization is not required. Efforts are made to limit admission to patients with relatively good prognosis, with a functional capacity of Classes I and II.

427628°—41——2

The medical staff consists of one visiting physician from New York City and a local physician who attends emergency calls. There are five trained nurses and two practical nurses at the farm, and two trained nurses engaged in follow-up work. Two teachers are supplied by New York City.

There is no research program other than follow-up studies, and there are no laboratory facilities. From the point of view of actual care of patients, Martine Farm probably does as good work as many institutions with more pretentious programs. The children seemed happy and more robust than in any of the other institutions studied.

Children's Heart Hospital, Philadelphia, Pa.—The name of this institution is misleading, since it is actually a convalescent sanatorium.

Children's Heart Hospital was founded in 1916, and moved to its present location in 1927. The principal buildings consist of a modern fireproof sanatorium and a nurses' home, located on a 14-acre tract. The sanatorium contains 2 wards with a total of 60 beds, 2 isolation rooms of 2 beds each, enclosed sun porches which are used for schoolrooms, and service rooms. The nurses' home contains the heating plant and a small laboratory. The total value of buildings and ground is $275,000. Despite its recent construction, the sanatorium building has several objectionable features. The wards are almost square in shape and contain 4 rows of beds. This makes isolation nearly impossible and there are only 4 other beds devoted to that purpose. The toilets are inconveniently located. There are no dining-room facilities so that even ambulatory patients must eat their meals in bed.

The hospital is privately owned and is operated under the auspices of the Philadelphia Heart Association. The annual budget amounts to approximately $34,000, of which $8,000 is received from the State, $1,500 from a trust fund, $9,000 from the families of patients, and the remainder from private contributions. The per diem cost is $1.65 per patient. Unlike most cardiac convalescent institutions, expenses are partly defrayed by a charge of $3 a week which is met either by the children's parents or referring social agencies. There are a few free beds and some patients are admitted at $1.50 a week. A few out-of-town patients are accepted at somewhat higher rates.

Children's Heart Hospital furnishes care to white and colored girls aged 3 to 13 years, white boys aged 3 to 12 years, and colored boys aged 3 to 11 years. Efforts are made to limit initial admissions to patients with early rheumatic heart disease with small hearts, good functional capacity, and without histories of congestive failure, or to patients who have had rheumatic fever but do not have definite organic cardiac involvement. Cases recovering from simple chorea are not as a rule admitted. Most patients are examined by a member of the staff prior to admission.

Because of lack of isolation facilities, a 2-week stay in a general

hospital is required before admission. This plan, while not the method of choice, has worked rather successfully. The objections are that it exposes a child to communicable diseases on the wards of a general hospital and entails an undesirable expense. A tonsillectomy is no longer required except when indicated. Patients who become acutely ill are sent back to the referring hospitals.

Nearly 1,200 patients have been treated since 1922. The present capacity is about 90 per year. The average duration of treatment is about 6 months. Home conditions are investigated by a social worker. Efforts are made to see that former patients continue treatment in a clinic or under the care of their family physician.

The medical staff consists of a physician-in-chief and eight attending physicians who serve for periods of 3 months each. There are seven medical consultants and one dental consultant. There is also a woman resident who is either a graduate student or a fourth-year medical student. The nursing staff consists of a chief nurse and an assistant, both of whom are graduate nurses, and ten practical nurses.

Children's Heart Hospital is used by the University of Pennsylvania for both undergraduate and graduate instruction. Research is limited to follow-up surveys, studies of familial incidence, and the influence of tonsillectomy, with subsequent removal of hyperplastic pharyngeal tissue, on the source of rheumatic infection.

Lymanhurst Cardiac Convalescent Home, Minneapolis, Minn.—Unlike other institutions, this sanatorium has an official connection and is under the joint control of the city health department and the school system. It was organized in 1935, and occupies the second floor of the Lymanhurst Health Center.

The building is about 20 years old. The value of the plant, which is not used entirely as a cardiac sanatorium, is estimated at $280,000. The sanatorium proper consists of two large wards having a total capacity of 40 patients, with additional isolation facilities and laboratories. The grounds cover the greater part of a city block.

Care is devoted mainly to children of school age less than 16 years old. Admission is generally limited to cases with Class I and Class II functional capacity and potential heart disease. Treatment is rendered free of charge. Patients are admitted from hospitals and clinics, on advice of private physicians, and from the school clinics to which the director is consultant cardiologist. Prehospitalization or previous tonsillectomies are not required.

The Lymanhurst Cardiac Convalescent Home is fortunate in having an official connection. As a result, it is able to maintain a follow-up clinic under the auspices of the school department. This clinic does not attempt to treat these cases but observes them periodically.

The medical staff consists of a director and a consultant otolaryngologist. The nursing staff, teachers, and most of the other employees

are employed by the Work Projects Administration. Consequently, owing to restrictions in the number of hours per week, neither the number of personnel nor the per diem cost is comparable to similar institutions.

La Rabida Jackson Park Sanatorium, Chicago, Ill.—This institution has been devoted to the treatment of heart disease since 1922. The present building, located in a public park, was erected in 1932. It is of brick construction, 2 stories high, and has a capacity of 100 beds. Its normal operating capacity is about 60 beds. Funds have not permitted a greater number. The plant and equipment are valued at $250,000. It is financed entirely by private donations, its budget amounting to about $25,000 a year. It is managed economically at a cost of less than $1.30 per patient-day.

For the most part, admissions are restricted to potential heart disease and Classes I and II rheumatic cardiac subjects. Classes III and IV cases are not desired but are occasionally accepted. Patients are admitted from cardiac clinics, homes, and general hospitals. Prehospitalization is not required. Cases, on admission, are isolated for a period of 1 week. Tonsillectomy is not required. The average duration of treatment is about 6 months.

Since 1922, 844 patients have received convalescent care. In 1938, 127 patients were treated. The explanation for the small number since 1922 is that only 30 beds were occupied during the depression.

La Rabida Jackson Park Sanatorium does not have a cardiac clinic of its own for after-care, nor does it have any social workers. Visiting nurses visit former patients every week for 6 weeks after discharge, then once a month for a year, and after that, every 6 months for several years. These visiting nurses make reports on the condition of former patients and ascertain that they attend clinics.

The medical staff consists of five attending physicians. There are also a dentist and an undergraduate interne. The nursing staff consists of two trained nurses and ten practical nurses. The Board of Education supplies three teachers who furnish bedside instruction.

NEWER SANATORIUMS

In addition to these well-established institutions devoted entirely to the treatment of heart disease in children, several others have been recently opened or will be opened in the near future. Since their operation as cardiac convalescent sanatoriums has not had the test of time, they will be described in considerably less detail.

Victoria Foundation, Inc., Morris Plains, N. J.—This institution, housed on a country estate about 10 miles from Morristown, N. J., was opened on June 1, 1940. It is planned to operate it on a modest

scale, providing care for about 20 rheumatic cardiac children from northern New Jersey.

Heart House, Pittsburgh, Pa.—This cardiac sanatorium, devoted to the care of children under 13 years of age with potential or moderately advanced rheumatic heart disease, was opened in June 1940. The building has a capacity of 50 beds, but owing to budgetary restrictions only 25 children will be cared for at present.

National Children's Cardiac Home, Miami, Fla.—Although this institution has been in existence for a number of years as a general convalescent sanatorium and has treated some rheumatic cardiac patients, its name has been recently changed and in the future it is planned to treat rheumatic cardiac patients only. Patients will be sent there from large northern cities, especially New York. A number will be admitted free of charge, while others will pay up to $10 a week. Parents are given to understand that children will not be accepted for less than a 2-year period. To avoid their becoming a charge upon local welfare agencies, parents of free-bed cases are not permitted to accompany their children to Florida. This convalescent institution should be in a position to furnish a practical test of the possible benefits of prolonged residence of rheumatic patients, under sanatorium care, in a subtropical climate.

GENERAL CONVALESCENT INSTITUTIONS FURNISHING CONVALESCENT CARE TO RHEUMATIC CARDIAC PATIENTS

For economic reasons it is doubtful whether special rheumatic heart disease sanatoriums are warranted in areas with less than a quarter of a million population. In any attempt to deal with this problem, a survey should be made of existing institutions to determine to what extent they may be utilized. Most general convalescent institutions treat some rheumatic cardiac patients; in many places it is desirable to increase the number of beds available for this purpose.

The description of institutions devoted in part to the care of these patients will be in somewhat less detail than that of the larger institutions devoted exclusively to this purpose. This should not be regarded as a reflection on the type of work they are doing. Treatment is comparable in many instances to that obtained in rheumatic cardiac sanatoriums.

New Haven Community Center, Hamden, Conn.—This institution, housed in brick buildings, has a capacity of 90 beds, of which about 20 are devoted to children with heart disease. New cases are isolated for 1 week. All cardiac cases are treated for at least 6 months; some as long as 2 years. The cost of maintaining a patient is about $2.50 a day. Parents bear little of this expense as most patients are from families on relief. In addition to treatment furnished at this insti-

tution, foster home care is provided to a limited extent. The cost of foster home care is about $2 a day.

Ridge Farm Sanatorium, St. Louis, Mo.—This sanatorium was established in 1913 for the general convalescent care of patients from the Children's Hospital. It has a capacity of 60 beds, about 20 of which are devoted to cardiac patients. Most of the patients have potential rheumatic heart disease or Class I or II rheumatic heart disease; a few severe cases are accepted. The average duration of treatment is about 6 months. Because of its affiliation with the Children's Hospital, all patients are admitted from that institution and their clinical records are sent with them to Ridge Farm. This eliminates duplication of records and reduces laboratory studies. Efforts are made to examine the siblings of patients.

In addition to institutional convalescent care, a number of patients are being furnished foster home care. The medical director of Ridge Farm favors this type of care because it is cheaper, more easily organized, and he believes that there is less danger of reactivation of rheumatic infection, especially on return home. The monthly cost of maintaining a patient at Ridge Farm is $75 to $80 as contrasted with $25 to $30 in foster homes.

Children's Convalescent Hospital, Rochester, N. Y.—This general convalescent institution is located on Lake Ontario about 10 miles from the center of Rochester. It is of brick construction, two stories high, and is valued at $161,000. It has a capacity of about 50 beds, of which 20 are devoted to cardiac patients. With the addition of a new wing, the number of cardiac cases admitted will be almost doubled. About 70 cases are treated each year. The average stay is about 3½ months. Cost per patient-day is about $2.15. Most patients are admitted free of charge, the hospital receiving its funds from the Community Chest.

Milwaukee Children's Convalescent Hospital, Milwaukee, Wis.—This institution has a capacity of 50 beds and occupies a well-constructed building located in the country. It is under the control of the Milwaukee Children's Hospital. Its chief source of support is the Community Fund. Very little assistance is received from patients' families. The per diem cost is about $3 per patient. The average duration of convalescent care for all types of patients is 78 days.

Theresa Grotta Home for Convalescents, Caldwell, N. J.—This institution has one building of 18 beds set aside for the care of children with potential and moderately advanced rheumatic heart disease. It is devoted primarily to the treatment of child residents of Newark, N. J., although nonresidents are sometimes accepted. The average duration of treatment is about 14 months. It is a nonprofit, charitable organization and receives most of its funds from the Newark

Community Chest. Although much of the treatment is rendered gratis, an effort is made to adjust the fee according to the financial status of the patient.

Happy Hills Home, Baltimore, Md.—This convalescent sanatorium has facilities for 20 patients. The average stay of children with rheumatic heart disease is between 6 months and a year. The estimated per diem cost per bed patient is $2.10; for "up-patients," $1.40. In addition, there is the St. Gabriel Convalescent Home which furnishes convalescent care to white girls. Both of these institutions are affiliated with the Department of Pediatrics of the Johns Hopkins Hospital.

OTHER CONVALESCENT INSTITUTIONS

In addition to these institutions, there are a number of others supplying convalescent care to children with heart disease. At the present time the New York Heart Association is compiling a directory, which will probably be published during the next few months.

Among the other convalescent institutions which furnish care free or at reasonable cost are the Willow Crest Home, Willow Crest, Pa.; Ivy Craft Convalescent Home, care of Jefferson Hospital, Philadelphia, Pa.; Dunwoody Home, Newtown Square, Pa.; Broomall Convalescent Home, Broomall, Pa.; Children's Hospital and Convalescent Home, Wellesley, Mass.; Christ Child Home, Rockville, Md.; Sarah Schermahorne Home, Milford, Conn.; Seashore Home, Atlantic City, N. J.; Children's Hospital of Michigan Convalescent Home, Farmington, Mich.; Loet Home, East View, N. Y.; and Children's Convalescent Home, Westfield, N. J. Owing to increased interest in this problem during the past few years, there are probably many more institutions than are listed here.

In some general convalescent institutions there have been prejudices against receiving rheumatic cardiac patients for fear of sudden death. Experience has shown that such fears are groundless. At the Children's Heart Hospital in Philadelphia, there has not been a sudden death among over 1,000 admissions during a period of 15 years. Other institutions corroborate this experience.

FOSTER HOMES

Foster home care provides an alternative to institutional care. The chief advantage is economy, since practically no initial outlay is required and the per diem cost is less. Foster home care is more flexible, and can be expanded or contracted according to case volume and financial resources. There is probably less danger of cross infection, and the child is maintained in an environment more nearly like that to which he will eventually return. It should be understood, however, that laxly managed foster homes constitute a physical and moral hazard.

There is only one organization in the United States with a unit devoted to furnishing convalescent care in foster homes exclusively to rheumatic cardiac children. Persons having in mind the establishment of similar units would do well to visit it and study its methods.

Speedwell Society, 20 East Forty-second Street, New York City.—The Nassau Cardiac Unit, West Hempstead, Long Island, of the Speedwell Society is devoted exclusively to furnishing prolonged care to 30 children aged 6 to 12 years with rheumatic or potential rheumatic heart disease. Children with these diseases are placed in foster homes within a radius of about a mile. Not more than three children are sent to one home. A visiting nurse makes daily contacts with the patients and a local physician examines them periodically. A special school is maintained in the center of the area. Children who become seriously ill are sent back to hospitals in the city. The duration of this foster care is two winters.

Extreme care is apparently used in selecting these homes, which are investigated both by the Society and the Department of Welfare of the State of New York. The foster family must be self-supporting to the extent that the taking of children is not necessary for its livelihood. Families with children under age 15 are not accepted. Complete physical examinations, including chest X-ray examinations, are required on all members, and all must have a negative Schick test. The dwellings are for the most part single-story bungalows. A toilet on the ground floor is required for two-story buildings.

The Speedwell Society receives about half of its funds from the city of New York and the remainder from contributions and patients' families. Most of these families pay about $3.50 a week, some $1 a week, others nothing. The total budget of the cardiac unit for 1939 was $16,000. The per capita cost per diem was $1.45. This includes the maintenance of the New York office, board and lodging, salaries of the unit physician, dentist, and nurse, supplementary milk, transportation, insurance, supplies, clothing, and laboratory fees.

COMMENT

Objectives.—Public and private agencies contemplating the establishment of institutions devoted to the care of children with rheumatic heart disease should have a clear idea of their objectives, difficulties likely to be encountered, and financial resources, both for construction and maintenance.

There are four distinct types of cases. The first two are more or less similar, while the third and fourth present problems of a somewhat different nature:

Type I. Potential rheumatic heart disease.—Here the problem of diagnosis is outstanding. If care is not exercised in the selection of these cases, the institution,

even though it serves a useful purpose, is likely to deteriorate into a preventorium and not serve the purpose for which it was primarily designed.

Type II. Early or moderately advanced inactive or slightly active rheumatic heart disease.—Since it is not practicable to institutionalize every child with a quiescent rheumatic lesion, it is necessary to select children with evidence of rheumatic activity or those who have recently had rheumatic activity. Certain cases should be admitted in an inactive state with the hope of building up the general condition to ward off attacks.

Type III. Cases with moderate to severe rheumatic activity.—These cases should not be treated at a convalescent institution unless it is staffed and equipped to handle patients requiring absolute rest in bed. Otherwise, these should be retained in a general hospital.

Type IV. Cases requiring domiciliary care.—This is the type of case with a greatly enlarged heart which hovers on the brink of cardiac insufficiency for months or even years and usually succumbs. In many instances it is perhaps well to permit the patient to return home and obtain what little pleasure life affords with his relatives, readmitting him to a general or children's hospital when occasion demands. Dictates of humanity often require that these patients be cared for in an institution. To place him on the wards of a general or children's hospital is expensive from the point of view of per diem cost and the use of a bed commonly devoted to the treatment of acute conditions. Hospitals have often discriminated against the "cripple who does not limp" by establishing arbitrary rules about the maximum period of hospitalization. This problem, although difficult, can be solved by the exercise of a spirit of charity by all concerned. Either the special institutions should be equipped to handle these cases or the general hospital should modify these restrictions. In the larger cities these cases could be treated more economically on chronic disease wards or in chronic disease hospitals.

Convalescent versus "all-purpose" hospitals.—Except in the larger cities in the northern part of the country, the greatest need is for convalescent institutions furnishing prolonged care for children of the first and second types. Other cases should be treated in general hospitals.

In the larger cities in the North, "all-purpose" rheumatic heart disease hospitals would probably be more efficient and economical. These institutions need not be housed under one roof. Initial attacks would be treated in a general hospital and admitted to the cardiac sanatorium as soon as they have sufficiently subsided. Cases of the third and fourth classes would be treated in an infirmary or even a special ward of a general hospital. Type I and Type II cases would be treated in wards devoted essentially to convalescent care, or foster home service could be provided. Should these cases develop signs of severe rheumatic activity, they would be hospitalized in the special ward or infirmary. The strictly convalescent features could be located in the suburbs or even in the country, with the ward or infirmary in the city. Such a plan would operate to an economic advantage as it costs less to treat rheumatic children in special wards than in general wards.

427628°—41——3

Location of institutions.—Most special institutions have been established in buildings previously devoted to the treatment of other diseases, or in buildings, usually dwellings, donated to them. Because of their inaccessibility, some institutions have had difficulty in obtaining the services of physicians. If its location is too distant or inconvenient to visitors, parents will not permit the admission of their children. Difficulty may also be encountered in obtaining nurses, other employees, and supplies. Proximity to referring hospitals must also be considered, as sometimes patients have to be sent back. Since the city school department is expected to furnish teachers, the institution should be located with that in mind.

Type of construction.—It is expected that for the most part existing buildings will be utilized at least in the beginning. Most of the special institutions will probably start with less than 50 beds, often less than 30. Provided it can be operated economically, the type of building is not in itself important. The treatment of rheumatic heart disease requires little special equipment. The prime considerations are the comforts of patients and personnel, and ample isolation facilities. Overcrowding should be scrupulously avoided.

In the opinion of the writer, patients should be isolated in cubicles. The arguments raised against it are that it produces an "institutional effect" and that patients mingle so much at meals and at school that it is an unnecessary refinement. The "institutional effect" can be overcome by maintaining morale in other ways. Although it is admitted that under normal circumstances these patients often come in close contact with each other, cubicles serve to isolate the child who is slightly to moderately ill.

Where new construction is contemplated, the same general rules obtain. Wards of not more than 20 beds each, with sufficient space for a kitchen, dining room, and recreation room which may also be used for teaching purposes, physicians' and nurses' offices, laboratory, service rooms, and quarters for personnel, should be provided. For the institution of less than 30 beds, single-story construction is probably better. In the larger institutions, the sicker children can be kept on the ground floors and ambulatory patients on upper floors, provided elevator service is available. Separate wards should be provided for girls and boys. Buildings should be fireproof.

Isolation facilities.—The need for sufficient isolation facilities cannot be too greatly emphasized. In addition to cubicles, an "overhead" of at least 20 percent of the beds on the wards should be provided in small rooms, not more than two beds to a room, and the beds should be separated by partitions.

Grounds.—Since most of the children are ambulatory, sufficient ground, level and partially shaded, should be provided for supervised recreation.

Equipment.—For a small institution devoted primarily to convalescent care, the equipment need not be elaborate. Neither an electrocardiograph nor X-ray equipment is necessary. If a choice must be made between purchasing one or the other of these pieces of equipment, X-ray equipment, particularly a fluoroscope with orthodiagraphic attachment, is likely to be of greater value. The writer has not been impressed with the practical application of electrocardiography to cardiac problems in childhood. The clinical laboratory may be limited only to facilities for routine blood counts, urinalyses, and erythrocyte sedimentation rates.

For the larger institution, X-ray and electrocardiographic equipment are almost essential for the proper evaluation of certain cases. Even in a large institution, the laboratory equipment need not be elaborate if the institution is devoted exclusively to treatment.

In the larger institutions, elevator service should be provided. In two-story dwellings, the installation of elevator service seems an unnecessary expense. Seriously ill children should be sent back to the referring hospital. Moderately ill children should be kept in bed. Any child unable to climb a flight of stairs should be in bed. In rheumatic heart disease in children, infection and not overexertion is the usual cause of cardiac insufficiency.

Research activities.—Nothing is more erroneous than the current practice of making a fetish over research. The immediate need is for treatment facilities; if there are then sufficient funds and sufficient ideas, a research program may be contemplated.

Clinical records.—The decision as to the type of clinical records is dependent on the kind of patients treated, and the size and training of the professional staff. Every patient should have a complete physical examination on admission and before discharge. Important observations should be recorded by attending physicians. Changes in weight, temperature readings, blood counts and sedimentation rates, X-ray and electrocardiographic findings should be recorded on appropriate forms. It is too much, however, to expect busy physicians serving gratuitously to make weekly progress notes on ambulatory cases, especially when few changes may be detected over a period of months. Should the records be intended for clinical research, they should be more elaborate. The graphic record systems in use at the Irvington House, the House of the Good Samaritan, and Saint Francis Cardiac Home should be studied.

Educational facilities.—Classroom and even bedside instruction, usually to the high school grades, should be provided. Children with average intelligence who are given a few hours' instruction a week individually or in small groups are generally able to resume their school work on discharge without loss of time. Occupational training, however, is probably not feasible in institutions of less than 100 beds.

Even then, it is well to remember that most of these patients are under 12 years of age and their life's work is not a serious consideration either to themselves or their parents, who should be advised concerning the future with a view of preparing their children for work not requiring strenuous exertion.

Psychological background.—It is a mistake to assume that every child with rheumatic heart disease is a psychiatric problem; it is doubtful whether the percentage is any greater than in the general population. On the basis of a number of years of practical experience, the writer has been impressed with the infrequency of behavior problems. Fear has also been expressed concerning the danger of creating an "institutional atmosphere" with deleterious effects on the mind of the growing child. To date none of these viewers-with-alarm have come forward with evidence to indicate that there is necessity for burdening the pay rolls of these institutions with psychiatrists, psychologists, and child-guidance experts.

Tact and kindness will do much to allay the danger of superimposing cardiac neuroses, which otherwise may become the more incapacitating factor. The attitude of the institution should be one of education, not repression. The child should not be constantly impressed with the seriousness of his condition or that he is different from other children. He should be taught how much rather than how little he may do with safety.

A definite program should be provided to include games commensurate with the physical condition, indoor recreation, story telling, motion pictures, religious services, birthday and other parties, and other morale-building activities. Much time should be spent out of doors when the weather and the patients' physical condition permits. Physical activity commensurate with clinical improvement should be encouraged. Standardized "graduated" exercises are not advised since they center too much attention on the heart and may result in a neurosis.

Summer cardiac camps.—These are mentioned only in condemnation. There is less danger of reactivity of rheumatic infection during the summer than any other season. There is no evidence that they have any carry-over value against reactivation of rheumatic infection during the winter and spring months. While rheumatic children, like other children, are entitled to happy vacations, summer camps should not be provided under the guise of therapy.

Duration of treatment.—Ever since cardiac convalescent institutions were first established, there has been a constant tendency to increase the length of stay. This has increased from an average of less than a month to about 6 months. The average is shortened because some patients are discharged against advice or sent back to referring institutions. Some students of this problem are advocating

the retention of these patients in special institutions or foster homes for a period of at least 2 years, with perhaps a furlough home during the summer months.

A child recovering from an attack of rheumatic fever during the spring may require only a relatively short period of convalescent care, perhaps about 3 months. On the other hand, a child who develops the disease in the fall or winter months will probably require at least 6 to 9 months of rest. Much depends upon the economic status of the family. Children coming from good home environment may be discharged much sooner. The case requiring the longest duration of treatment is the one which requires domiciliary care. This may require a 2- or 3-year stay in a special institution, especially if home conditions are unfavorable.

It seems evident that any institution should plan to furnish treatment for an average of about 1 year. Many cases will require less than that, while others will require more. In any event, there should not be a fixed upper limit to the duration of treatment which may be prolonged almost indefinitely by activity of rheumatic infection.

Physical examinations of other members of patients' families.—Since additional cases of rheumatic heart disease, rheumatic fever, or chorea occur in about 40 percent of these families, it is highly desirable that other members, especially siblings, be examined either at the special institutions or by the cardiac clinics of referring institutions according to a prearranged plan.

Cardiac clinics in conjunction with special institutions.—Except in infrequent instances in which a special institution is located near the center of a large city, like the House of the Good Samaritan in Boston, treatment of discharged patients should devolve upon referring institutions. This prevents duplication of effort, and encourages clinic attendance in the home vicinity of the patient. Special institutions with research programs could pattern after Irvington House and establish a purely diagnostic follow-up clinic which the patient attends once or twice a year.

Medical personnel.—Very few institutions will be able to pay attending physicians. These should be practicing cardiologists and pediatricians interested in the problem. To provide variation and to prevent the work from becoming a burden, rotating services of not more than 4 months should be provided. Admissions are facilitated by selecting visiting physicians from a number of hospitals.

In nearly every city large enough to warrant the establishment of a special institution, it is possible to induce specialists to serve gratuitously as consultants. With the possible exception of the otolaryngological consultant, few demands are made on their time. In addition, an ophthalmologist, a dermatologist, a roentgenologist (or at least a physician versed in this subject), and a laboratory man are usually

required. A consultant cardiologist and pediatrician are often desirable. Larger institutions may require a psychiatrist and an orthopedist.

Within certain limits the necessity for a resident physician depends upon the type of patients treated. Even a relatively small institution treating seriously ill patients may require the services of a resident physician who may also be engaged in research work. It is doubtful if most institutions with a bed capacity of less than 80 will require the services of a resident physician, provided the visiting staff may be obtained without delay.

A number of institutions furnish board and room to fourth-year medical students who are responsible for routine histories and physical examinations, progress notes, and laboratory work, especially at night. The histories and physical examinations should be checked by practicing physicians and should not be used for research.

Dentists.—The services of a dentist are required for the prevention of foci of infection, for assistance in proper mastication, and for the treatment of dental emergencies. An institution of 30 beds would probably require a dentist about 4 hours a week, larger institutions for proportionate periods.

Research staff.—Here the sky is the limit. As has been previously indicated, the present need is for treatment rather than research centers. Institutions large enough to have resident physicians probably will engage in certain research activities. The nature of the research will determine the requirements for a research staff. For accounting purposes, funds devoted to research should be considered on a different basis from ordinary operating expenses.

Trained nurses.—As in other hospitals, a well-trained, sympathetic, tactful, but firm, chief nurse is a requisite. The number of nurses is dependent largely on the type of patients. Every institution, regardless of size, needs at least two trained nurses. If only convalescent care is furnished and patients requiring bed care for more than a few days are returned to the referring hospital, about one trained nurse for each 20 patients will suffice. Where seriously ill patients are retained, the number of trained nurses will have to be increased. This is not altogether an added expense, since the number of practical nurses can thereby be decreased.

Practical nurses.—These may be employed in convalescent institutions filled largely with ambulatory cases. Here the problem is largely supervision and household care rather than nursing. Approximately one practical nurse for every ten patients is required. Children sick enough to require absolute bed rest should be under the supervision of a trained nurse.

Dietitians.—Except in institutions of more than 100 beds, the

services of a full-time dietitian will not be required. The chief nurse or an assistant can assume this duty.

Social workers.—A social service department is almost a necessity for the proper functioning of any cardiac convalescent institution of more than 30 beds. It should be responsible for establishing friendly relations with parents prior to the child's admission, for obtaining first-hand information about the social status, financial condition, and environment of the family, and seeing that discharged patients obtain proper medical supervision. This department may also assist in follow-up studies. The trained social worker can also facilitate transfer of patients from general hospitals to convalescent institutions, and, in event of emergency, facilitate their return to referring institutions.

Other personnel.—The necessity for other personnel, both inside the institution and on the grounds, is dependent on so many factors, such as location, climate, construction of buildings, size of grounds, and bed capacity, that it is not possible to discuss this aspect in detail.

REFERENCES

(*1*) Swift, Homer F.: Public health aspects of rheumatic heart disease; incidence and measures for control. J. Am. Med. Assoc., **115**: 1509 (1940).
(*2*) Thornton, C. E.: The London scheme for the treatment and supervision of juvenile rheumatism. Acta Rheumatologica, No. 33, Anno IX, May 1937.
(*3*) London County Council. Annual Report of the Council, 1937. Vol. III. (Part II) Public Health. (Report for the year 1937 of the School Medical Officer, page 41). Published by the London County Council.
(*4*) Hedley, O. F.: Incidence of rheumatic heart disease among college students in the United States based on replies to a questionnaire. Pub. Health Rep., **53**: 1635 (1937).
(*5*) Robey, W. H. (Representing the New England Heart Association): A cardiac survey of children in Boston public schools. The Nation's Health, **9**: 21 (1927).
(*6*) Nomenclature and criteria for diagnosis of diseases of the heart. 4th ed. New York Heart Association, New York, 1939.
(*7*) Cobrun, A. F., and Moore, Lucile V.: Prophylactic use of sulfanilamide in streptococcal respiratory infections, with special reference to rheumatic fever. J. Clin. Invest., **18**: 147 (1939).

SIPHONAPTERA: THE GENERA *AMPHALIUS* AND *CTENOPHYLLUS* IN NORTH AMERICA[1]

By WILLIAM L. JELLISON, *Assistant Parasitologist, United States Public Health Service*

Two genera of fleas, *Amphalius* and *Ctenophyllus*, are characteristic parasites of pikas, *Ochotona* spp., the smallest members of the order Lagomorpha. In the Palearctic region both these genera of fleas are represented by several species but in North America there appears to be but a single species of each insofar as can be judged by material at hand and published records. These are closely related to Asiatic forms.

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

In this paper the North American species are redescribed, figured, and all available distributional data given. At least one species should be found wherever pikas occur on this continent, yet both species remain rare in collections. The writer has been fortunate to secure through loans from 5 museums the material herein recorded, representing 16 field collections.

Amphalius Jordan 1933

Genotype. *Ceratophyllus runatus* Jordan and Rothschild, 1923.
1933 *Amphalius* Jordan Novitates Zoologicae, 39: 74.

Amphalius necopinus (Jordan)

1925 *Ceratophyllus necopinus* Jordan. Novitates Zoologicae, 32: 110, text figure 37
1933 *Amphalius necopinus* (Jordan). Jordan: Novitates Zoologicae, 39: 74.

Originally described from a pair taken from "*Ochotona muiri*"= *Ochotona schisticeps muiri* in Mono County, Calif.

Head of male figured. Antennal groove not continuous across dorsum of head. Frontal tubercle prominent, acute. Eye well pigmented. Preantennal row of 5 bristles. Ocular row of 3, the uppermost on a level of the eye and not close to the antennal groove. A few other fine bristles on the gena with a row of 6 fine ones between the medium and ventral bristles of the ocular row. Gena acute. Bristles on second segment of antenna equaling or exceeding the club of the antenna. Club distinctly segmented. Two bristles on occiput above middle of antennal groove. Antennal groove bordered dorsally with fine setae. About 8 bristles on each side of posterior margin of the head. Labial palpi 5 segmented, not quite equaling anterior coxae.

Thorax and appendages.—Pronotum with an anterior row of 14 large bristles and a ctenidium of 28 spines. Long thin bristles on inside of hind coxae from base to apex. Outside of forefemur with minute bristles. Fifth segment of all tarsi with 5 lateral bristles.

Abdomen.—The apical spinelets are in groups on each side of tergites 1 to 4 and number 2, 3, 3, and 3, respectively.

Modified segments.—Male. The eighth sternite is figured. It bears a pair of subterminal ventral bristles, a terminal sclerified area and a sharp dorsal projection. The large dorsal membranous plume on this sternite is not figured, as its details are obscured by other sclerites in all preparations available. Sternite 9 is figured. The semicircular proximal lobe, curved spine, and ventral hook are very characteristic for members of this genus. The long blade projecting beyond the distal lobe as figured may not be a part of the ninth sternite. Its basal connections are not distinct. In a few specimens available from British Columbia this blade is much wider. The

claspers are figured. The immovable process is long and narrow. The long, posterior ventral arm on the movable process of the clasper distinguishes this from all other North American fleas. Dr. Jordan's figure (1925) of this character is incomplete or from a damaged specimen. The long process and dilated apex resemble the head and neck of a bird.

Female: The seventh sternite is figured. The posterior margin bears 2 distinct lobes, the upper, long, wide and truncated, the lower, short and rounded. The bristles on each side of this sternite are divided into an upper group of 6 and a ventral group of 3. The receptaculum seminis is U-shaped with no marked division into head and tail, though the head is slightly wider and more sclerified. The style is figured and is about twice as long as it is wide. There is an unusually large number of lateral and subterminal bristles, 12 or more, on the style in this species.

Asiatic representatives of this genus are *A. runatus* (Jordan and Rothschild) 1923, and *A. clarus* (Jordan and Rothschild) 1922.

Previous records:

Jordan (1925). Host, *"Ochotona muiri"*=*Ochotona schisticeps muiri*, Pine City, Mono County, Calif., July 1922. 1 male, 1 female (types).

New records: (See distribution map.)

From the collection of G. P. Holland, Livestock Insect Laboratory, Kamloops, British Columbia.

1. Host, *Ochotona princeps cuppes*, Reno Mountain, Salmon, British Columbia, 1 male, collected by T. K. Moilliet.
2. Host, *Ochotona princeps*, Banff, Alberta, July 14, 1939, 2 males, 1 female, collected by J. D. Gregson.

In the collection of the Rocky Mountain Laboratory, Hamilton, Mont.

3. Host, *Ochotona* sp., Boulder County, Colo., June 15, 1939. 7 males, collected by Dr. Gordon E. Davis.
4. Host, *Ochotona* sp., Rocky Mountain National Park, Colo., June 11, 1940. 3 males, 1 female, collected by R. H. Baker.

Ctenophyllus Wagner 1927

Genotype: *Ceratophyllus armatus* Wagner 1900.
1927. *Ctenophyllus* Wagner. Konowia, **6:** 108–112.

Ctenophyllus terribilis (Rothschild)

1903. *Ceratophyllus terribilis* Rothschild. Novitates Zoologicae, **10:** 317–318, plate 9, figures 1–3.
1905. *Ceratophyllus terribilis* Rothschild. Baker: Proceedings United States National Museum, **29:** 134, 151.
1933. *Ctenophyllus terribilis* (Rothschild). Jordan: Novitates Zoologicae, **39:** 70–71.
1935. *Ctenophyllus terribilis* (Rothschild). Spencer: Proceedings of the British Columbia Entomological Society for 1935, p. 14.

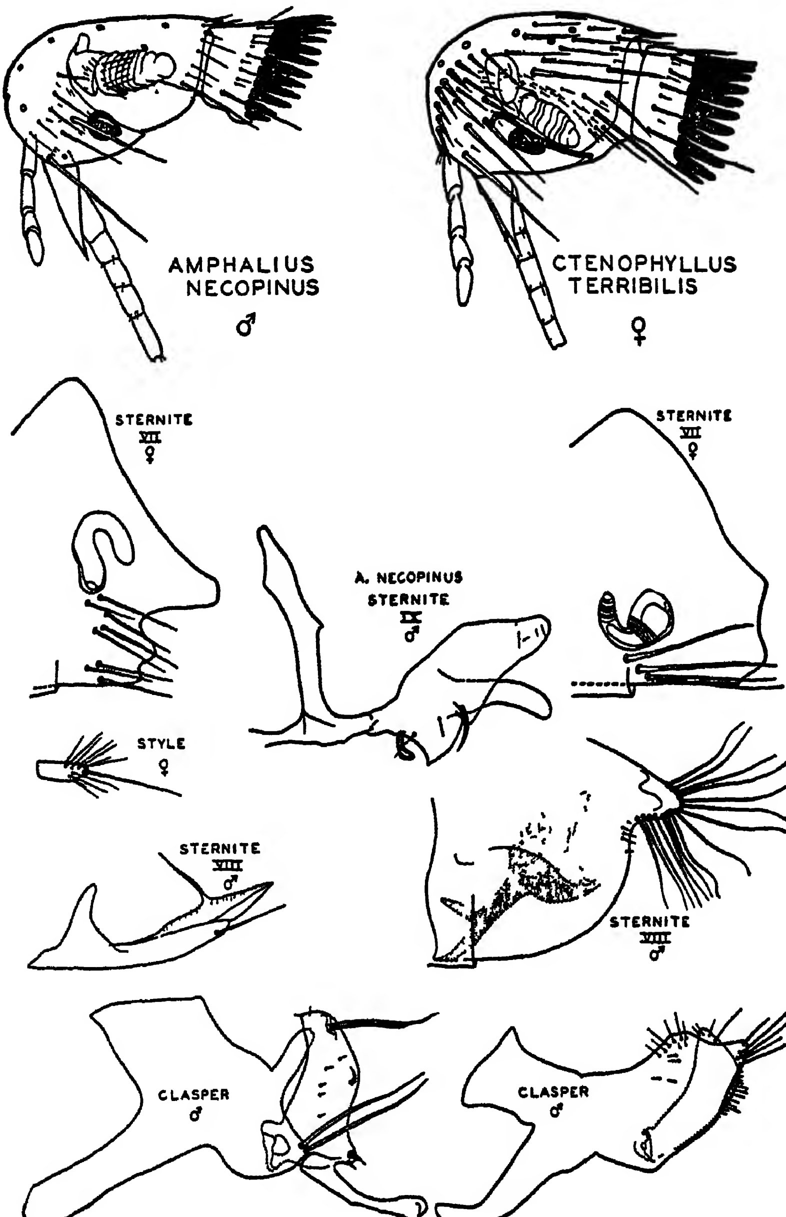


FIGURE 1.—*Amphalius necopinus* left, *Ctenophyllus terribilis* right.

1936. *Ctenophyllus terribilis* (Rothschild). Wagner: Canadian Entomologist, 68: 195.

1940. *Ctenophyllus terribilis* (Rothschild). Holland: Proceedings of the Entomological Society of British Columbia. 36: Feb 24, 1940.

1940. *Ctenophyllus terribilis* (Rothschild). Hubbard: Pacific University Bulletin, 37: Number 4.

Originally described from 4 males and 5 females collected from "*Lagomys princeps*"=*Ochotona princeps* in Canadian National Park and 1 female from Banff. Both localities are in Alberta, Canada.

Head of female is figured. The head of the male has been figured by Rothschild (1903). The antennal groove is not continuous across the dorsum of the head. The frontal tubercle is prominent. A row of two normal and seven stout spinelike bristles extend along the front margin of the head. These are shorter and heavier in the female. Between this row and the ocular bristles are three long bristles. The ocular row contains three and sometimes four large bristles, the upper one is above the eye and near the margin of the antennal groove. There are other fine bristles on the gena and just anterior to the base of the antennae. The two oblique rows of bristles on the occiput contain about five bristles each. The fine bristles bordering the antennal groove are larger than in most fleas. The bristles on the second segment of the antennae are very small, not equaling the club. The club of the antennae is distinctly segmented. The labial palpi are five-segmented and equal about three-quarters the anterior coxae. The gena is acute, the eye well pigmented. Perhaps the most characteristic, though not very conspicuous, feature of the head is the internal rodlike structures on each side which extend from between the second and third bristles of the ocular row on the gena, posteriorly, concealed by the eye, to the hind margin of the head near the end of the antennal groove. According to Jordan (1933) the only other ceratophylline fleas known in America that have this character are of the genus *Odontopsyllus*.

Thorax and appendages.—The pronotum bears an anterior row of about 12 large and a few fine bristles and a ctenidium of 22 spines. The bristles on the inside of the hind coxae are long and slender, not approaching spiniform as in *Odontopsyllus*. The fifth segment of all tarsi has 5 lateral bristles.

Modified segments.—Male (fig. 1): The eighth sternite is bulbously rounded ventrally and is reinforced internally by a pair of Y-shaped sclerifications. The dorsal angles (right and left) of the eighth sternite project posteriorly and each bears a marginal row of 12 to 15 long, wavy bristles. The claspers are figured. The immovable process almost covers the movable process. Acetabular bristles are not discernible. The details of the ninth sternite are concealed by the other complex, bristled sclerites.

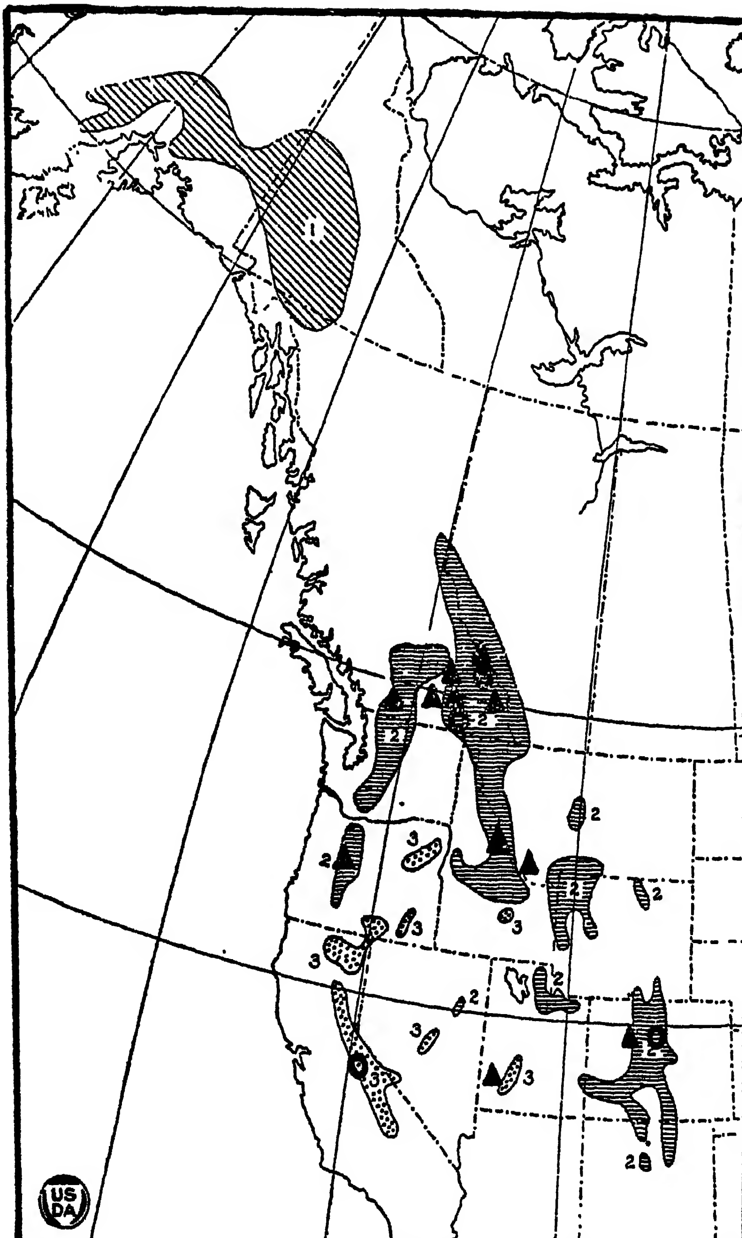


FIGURE 2.—Distribution of the American species of *Ochotona* (subgenus *Pika*) in the western United States, Canada, and Alaska. 1. *O collaris*. 2. *O. princeps*. 3. *O. schisticeps*. From Howell (1924) and collection records of their fleas. ●=*Amphalius necopinus*, ▲=*Ctenophyllus terribilis*.

Female (fig. 1): The posterior dorsal angle of the seventh sternite is not rounded, the posterior margin is nearly straight, and it bears a small ventral sinus and a ventral row of four bristles on each side. The head of the receptaculum seminis is nearly spherical, the tail is of even width, curves dorsally, and lacks an apical appendage. In shape and size it resembles that found in several species of the genus *Odontopsyllus*. The style is three times longer than broad and bears a terminal and two lateral bristles.

Asiatic representatives of this genus are *C. armatus* (Wagner) 1900, *C. subarmatus* (Wagner) 1900, and *C. hirticrus* (Jordan and Rothschild) 1923. Wagner (1936) states that *C. terribilis* is the nearest relation of *C. subarmatus*.

Previous records:

Rothschild (1903). Host, "*Lagomys princeps*" = *Ochotona princeps*, Canadian National Park, Alberta, July 26, 1899, 4 males, 5 females, and Banff, Alberta, July 26, 1899, 1 female (the type series).

Holland, (1940). Host, *Ochotona princeps*, Reno Mountain, Salmon, May 29, 1936, Mt. Dunn, North Thompson Valley, August 11, 1937, and 5 miles west of Salmon Arm, August 10, 1938, all localities in British Columbia.

Hubbard (1940). From "Conies" = *Ochotona* spp., Cascade Mountains, Oreg., and Goose Lake, Wash.

New records: [2] (See distribution map.)

From the collection of G. P. Holland, Livestock Insect Laboratory, Kamloops, British Columbia.

1. Host, *Ochotona princeps*, Robbins Range, British Columbia, October 3, 1939. 1 female, collected by J. D. Gregson.
2. Host, *Ochotona princeps*, Banff, Alberta, August 14, 1939, 2 females (topotypes) collected by J. D. Gregson.
3. Host, *Ochotona princeps*, Tappen, British Columbia, March 31, 1940, 1 male, 1 female, collected by G. P. Holland.
4. Host, *Ochotona princeps*, Robbins Ridge, British Columbia, October 3, 1937, 1 male, 1 female, collected by J. D. Gregson.

[2] Since the preparation of this manuscript and distribution map, the following specimens of fleas from pikas have been examined:

Ctenophyllus terribilis (Rothschild)

Host, *Ochotona* sp., Mt. Timanogus, Utah, July 2, 1937, 11 females, collected by J. S. Stanford and received from Robert Traub.

Host, *Ochotona princeps*, Park County, Montana, June 29, 1938, 3 males, 2 females, received from Dr. N. E. Good.

Host, *Ochotona princeps saxitalis*, San Juan County, Colorado, June 26, 1939, 1 male, 2 females, received from Dr. N. E. Good.

Amphalius necopinus (Jordan)

Host, *Ochotona princeps*, Park County, Montana, June 29, 1938, 1 male, received from Dr. N. E. Good.

Host, *Ochotona collaris*, Red Mountain, Mt. Hayes Section, Alaska, June 13, 1941, 2 males, from Jack Warwick.

Geusibia ashcrafti (Augustson)

A new species of pika flea from *Ochotona schisticeps albatus*, Fresno County, California, has been described as *Geusibia ashcrafti* by G. F. Augustson (Bull. Southern Calif. Acad. Sci., 39: 203–204 (1940)). It is also recorded as *Augustsonius ashcrafti* (Augustson) by C. A. Hubbard (Pacific Univ. Bull., 37(8): 3–4 (1941)). So far this species is known only by females but if Mr. Augustson's generic assignment is correct, it adds a third genus of pika fleas to those represented in both Asia and North America. *Geusibia torosa* Jordan, 1932, the genotype, was described from *Ochotona cansa* in Szechuan, China.

5. Host, *Ochotona princeps brooksi*, Dunn Peak, British Columbia, August 11, 1937, 1 male, collected by G. P. Holland.
6. Host, *Ochotona princeps*, Reno Mine, British Columbia, May 29, 1936, 1 male, collected by G. P. Holland.

From the United States National Museum, Washington, D. C.:

7. Host, *Ochotona princeps cuppes*, Okanagan, British Columbia. 1916. Collected by J. A. Munro, 1 female. (Data received from Dr. H. E. Ewing.)

From Prof. C. A. Hubbard, Pacific University, Forest Grove, Oreg.:

8. Host, *Ochotona princeps*, Fish Lake, Santium National Forest, Oreg., July 20, 1938. 1 female, collected by C. A. Hubbard.

From the collection of Dr. M. A. Stewart, University of California, Davis, Calif.: three specimens of *Ctenophyllus terribilis* which were duplicates from collections credited to G. P. Holland above, and add no additional records.

In the collection of the Rocky Mountain Laboratory, Hamilton, Mont.:

9. Host, *Ochotona princeps*, Beaverhead County, Mont., August 4, 1937, 1 female, collected by Wm. L. Jellison.
10. Host, *Ochotona* sp., Beaver County, Utah, July 1936, 1 female.
11. Host, *Ochotona princeps*, Silverlake, 32 miles west of Boulder, Colo., June 15 and 16, 1939, from 4 separate hosts as follows: 3 males, 7 females; 3 males, 10 females; 2 females; 2 females. Collected by Dr. Gordon E. Davis.
12. Host, *Ochotona* sp., Ravalli County, Mont., May 27, 1923, 1 male.

DISCUSSION

The mammalian family Ochotonidae appears to include but the single genus *Ochotona* although several subgenera are recognized. In a revision of the American forms, Howell (1924) has recognized three species and numerous subspecies, all of which he has referred to the subgenus *Pika* of Lacépède. In this subgenus he would also include several widely distributed Palearctic species. The presence of these two very distinct genera of fleas, *Amphalius* and *Ctenophyllus*, as almost exclusive parasites of pikas in Asia and North America not only indicates that they are true *Pika* fleas but that their relationship with this host antedates the separation of the pikas in the two faunal areas. Such a relationship has previously been suggested by Wagner (1932) for fleas of the genus *Oropsylla* which are characteristic parasites of *Citellus* and *Marmota*. As the Ochotonidae constitute a family of the Lagomorpha distinct from the true rabbits or Leporidae some relationships should be expected between the fleas of pikas and those of rabbits. So far no specimens of the genera *Cediopsylla*, *Hoplopsyllus*, or *Odontopsyllus* that are characteristic parasites of North American rabbits have been recorded for pikas although their ranges and habitats coincide in many instances. Jordan (1933) expressed a relationship by assigning only the genera *Odontopsyllus* and *Ctenophyllus* of the North American fleas to the group 1 of the

Ceratophyllinae while all other genera are assigned to group 2 and are largely rodent fleas. A careful comparison of these two genera emphasizes this relationship. To the writer this would suggest the possibility that *Odontopsyllus* and *Ctenophyllus* evolved from an ancestral form parasitic on Lagomorpha before the families Ochotonidae and Leporidae became distinct.

REFERENCES

Howell, A. H.: Revision of the American pikas (genus *Ochotona*). North American Fauna, Number 47 (1924).

Wagner, J.: Die Bedeutung der Flöhe für die Frage nach der Genesis der Säugetierfauna. Zoogeographica, 1: 263–268 (1932).

DEATHS DURING WEEK ENDED NOVEMBER 22, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 22, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,354	8,074
Average for 3 prior years	7,987	
Total deaths, first 47 weeks of year	392,402	393,062
Deaths per 1,000 population, first 47 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	524	501
Average for 3 prior years	495	
Deaths under 1 year of age, first 47 weeks of year	24,876	23,592
Data from industrial insurance companies:		
Policies in force	64,655,900	64,819,724
Number of death claims	10,168	10,773
Death claims per 1,000 policies in force, annual rate	8.2	8.7
Death claims per 1,000 policies, first 47 weeks of year, annual rate	9.3	9.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED NOVEMBER 29, 1941

Summary

There was little change in the incidence of influenza for the country as a whole, with 2,478 cases reported as compared with 2,469 for the preceding week. The decrease in Texas, from 1,295 to 1,088 cases, was slightly more than compensated for by minor increases in other States, principally in the southern and western areas—South Carolina from 291 to 378, Virginia from 157 to 184, and Arizona from 105 to 143. The total number of cases reported for the current week is above the 5-year (1936–40) median (1,588), but below the figure for the corresponding week last year (3,014), when the mild epidemic of last season had begun on the West Coast.

A total of 112 cases of poliomyelitis was reported, as compared with 158 for the preceding week. New York, with 17 cases, and Tennessee, with 13, were the only States reporting more than 10 cases.

New York reported 88 cases of typhoid fever as compared with 6 for the preceding week, and Ohio reported 16 cases (9 last week). The total for the country as a whole is 215, as compared with a 5-year median expectancy of 188.

Of 78 cases of endemic typhus fever, Georgia reported 30, Louisiana and Texas 11 each, and Alabama 10.

Of the 9 common communicable diseases reported in the following table, the total numbers of cases to date (first 48 weeks) for influenza, measles, and poliomyelitis are above the 5-year median expectancy.

The crude death rate for the current week in 88 large cities of the United States is 11.8 per 1,000 population, as compared with 11.7 last week and 12.0 for the 3-year (1938–40) average.

Telegraphic morbidity reports from State health officers for the week ended November 29, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940	
NEW ENG.												
Maine	0	0	2	------	3	3	281	125	38	0	0	0
New Hampshire	0	0	1	------	----	----	11	0	1	0	0	0
Vermont	0	0	0	------	------	------	0	19	19	0	0	0
Massachusetts	4	4	5	----		----	134	226	211	2	1	1
Rhode Island	1	1	0	------	------	------	20	0	0	0	0	0
Connecticut	1	0	2	3	2	2	86	1	53	2	1	0
MID. ATL.												
New York [1]	14	10	27	[2] 1	[2] 2	[2] 11	263	644	373	12	4	5
New Jersey	4	11	18	15	4	13	22	258	31	2	0	2
Pennsylvania [1]	12	11	36	--	-	--	286	746	61	5	2	3
E. NO. CEN.												
Ohio	21	11	41	13	25	25	25	65	45	1	1	1
Indiana	16	21	25	39	4	13	21	19	13	1	1	1
Illinois	30	42	42	11	5	10	31	310	28	2	3	3
Michigan [3]	12	13	21	1	12	3	63	323	156	2	0	0
Wisconsin	0	0	3	17	35	35	125	291	82	1	0	0
W. NO. CEN.												
Minnesota	3	1	4	---	------	1	53	75	61	1	0	1
Iowa	5	6	6		--	1	24	20	20	1	0	0
Missouri	10	4	17	2	1	21	11	12	9	0	0	0
North Dakota	3	2	2	16	13	16	70	0	1	0	0	0
South Dakota	6	8	1	---	---	---	6	1	3	0	0	0
Nebraska	4	0	4	---	---		3	0	1	0	0	0
Kansas	7	3	6	5	5	5	12	21	20	1	0	0
SO. ATL.												
Delaware	0	0	0	2	---	---	2	5	3	0	0	0
Maryland [3]	8	6	11	5	3	4	97	2	8	2	0	1
Dist. of Col	0	0	2	1	1	1	4	1	2	1	0	0
Virginia [1]	27	32	38	184	107	107	117	20	20	2	1	3
West Virginia	7	3	20	13	7	8	180	3	3	0	1	2
North Carolina [1]	70	30	64	1	10	6	410	25	136	0	1	2
South Carolina	11	9	29	378	290	293	12	26	17	1	0	3
Georgia [1]	19	9	22	40	24	24	35	7	7	0	1	1
Florida [1]	8	5	5	---	11	6	6	1	2	2	0	0
E. SO. CEN.												
Kentucky	13	14	16	2	18	17	87	145	69	4	0	2
Tennessee [1]	16	11	20	43	26	44	30	11	11	1	1	1
Alabama [1]	36	23	31	97	25	101	41	31	18	0	2	2
Mississippi [3]	15	6	12	----	----	------	---	------	------	1	0	0
W. SO. CEN.												
Arkansas [1]	17	11	16	82	43	59	26	9	9	1	0	0
Louisiana [1]	8	19	17	16	3	4	2	0	1	1	0	0
Oklahoma [4]	21	14	21	120	[illegible]	87	30	0	7	1	1	0
Texas [1]	67	28	57	1,638	[illegible]	[illegible]	141	24	24	0	0	1
MOUNTAIN												
Montana [4]	0	2	1	8	[illegible]	4	27	4	9	0	0	0
Idaho	4	0	2	4		1	10	0	49	0	0	0
Wyoming	3	3	0	2	4		1	2	2	0	0	0
Colorado	14	6	10	33	5	5	126	60	41	1	0	0
New Mexico	4	0	3	2	3	2	0	21	21	1	0	0
Arizona	1	6	6	143	350	79	22	29	1	0	0	0
Utah [3]	0	0	0	1	9	9	62	2	8	0	0	0
Nevada	0	0	----	------	------	------	0	0	------	0	0	------
PACIFIC												
Washington	2	2	3	------	4	------	11	11	34	0	0	0
Oregon	3	3	3	23	81	24	58	19	11	1	0	1
California	18	29	39	70	1,490	63	446	51	57	0	1	1
Total	545	416	829	2,478	3,014	1,588	3,530	4,065	3,425	53	22	40
48 weeks	15,092	14,346	25,336	586,956	182,210	165,468	851,423	252,893	277,990	1,880	1,543	2,666

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 29, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940		Nov. 29, 1941	Nov. 30, 1940	
NEW ENG.												
Maine	0	0	0	13	2	18	0	0	0	0	0	0
New Hampshire	0	0	0	10	5	8	0	0	0	0	0	0
Vermont	0	0	0	2	9	9	0	0	0	0	1	0
Massachusetts	1	0	0	203	124	124	0	0	0	2	1	1
Rhode Island	0	0	0	6	2	12	0	0	0	0	0	1
Connecticut	2	0	0	19	31	37	0	0	0	0	0	0
MID. ATL.												
New York [1]	17	2	3	205	230	292	0	0	0	88	15	9
New Jersey	6	1	0	101	103	97	0	0	0	1	0	4
Pennsylvania [1]	3	5	5	188	196	296	0	0	0	7	11	16
E. NO. CEN.												
Ohio	5	13	3	240	168	317	2	0	2	16	1	7
Indiana	3	9	1	100	93	153	0	0	4	4	2	1
Illinois	6	16	6	170	292	342	0	3	1	2	7	7
Michigan [3]	1	5	3	231	153	281	0	7	4	1	1	4
Wisconsin	1	17	3	185	154	159	2	3	3	1	0	0
W. NO. CEN.												
Minnesota	1	5	3	54	68	131	0	10	10	0	0	0
Iowa	1	6	4	38	65	71	0	0	6	0	1	1
Missouri	1	4	2	87	54	94	5	1	7	7	3	6
North Dakota	0	0	0	14	11	41	1	0	4	0	0	0
South Dakota	0	0	0	15	32	32	0	1	1	0	0	0
Nebraska	0	3	0	27	11	33	0	0	1	0	0	0
Kansas	1	6	0	76	68	139	1	0	1	1	1	1
SO. ATL.												
Delaware	0	0	0	21	14	14	0	0	0	0	0	0
Maryland [3]	4	0	0	50	51	52	0	0	0	5	4	5
Dist. of Col.	1	1	0	18	19	16	0	0	0	1	0	0
Virginia [1]	5	4	1	50	66	54	0	0	0	11	4	7
West Virginia	1	10	1	72	39	64	0	1	0	0	4	4
North Carolina [1]	1	0	0	108	84	82	0	0	0	3	1	1
South Carolina	0	1	0	12	23	13	0	0	0	4	0	0
Georgia [1]	4	1	1	47	19	34	0	0	0	5	6	6
Florida [1]	0	2	0	4	7	7	0	0	0	1	1	1
E. SO. CEN.												
Kentucky	4	3	2	90	78	78	0	0	0	7	4	4
Tennessee [1]	13	2	1	85	58	61	0	0	0	6	4	4
Alabama [1]	8	0	2	42	30	27	0	0	0	3	5	2
Mississippi [3]	2	2	2	22	10	13	0	0	0	3	3	3
W. SO. CEN.												
Arkansas [1]	1	0	1	18	20	20	2	5	1	5	4	4
Louisiana [1]	1	5	1	7	15	15	0	0	0	8	9	9
Oklahoma [4]	2	0	0	22	38	38	1	0	2	7	4	5
Texas [1]	2	4	4	54	58	85	0	0	1	7	8	9
MOUNTAIN												
Montana [4]	0	0	0	18	20	31	0	0	1	0	1	1
Idaho	1	0	1	10	19	19	0	0	1	0	0	1
Wyoming	0	0	0	5	9	8	0	0	0	0	0	0
Colorado	1	0	0	24	24	41	0	0	2	0	3	8
New Mexico	0	0	0	11	11	16	0	0	0	2	3	7
Arizona	1	0	0	3	2	5	0	1	0	1	0	1
Utah [1]	0	0	0	20	14	24	0	0	0	0	3	0
Nevada	0	0	------	0	1	------	0	0	------	0	0	------
PACIFIC												
Washington	3	1	1	39	35	50	0	0	1	3	2	2
Oregon	0	0	1	6	17	41	5	7	7	0	2	2
California	8	2	9	111	140	180	0	1	1	3	2	11
Total	112	130	103	2,903	2,792	3,896	19	40	135	215	121	188
48 weeks	8,805	9,509	7,027	115,531	143,545	171,461	1,297	2,242	9,161	8,169	9,159	13,714

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended November 29, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, week ended Nov. 29, 1941	Whooping cough, week ended Nov. 30, 1940
NEW ENG.		
Maine	19	24
New Hampshire	5	0
Vermont	34	19
Massachusetts	207	210
Rhode Island	59	8
Connecticut	64	91
MID. ATL.		
New York [1]	619	562
New Jersey	214	187
Pennsylvania [1]	183	503
E. NO. CEN.		
Ohio	159	271
Indiana	34	19
Illinois	270	220
Michigan [3]	415	308
Wisconsin	287	117
W. NO. CEN.		
Minnesota	69	130
Iowa	10	37
Missouri	36	51
North Dakota	10	32
South Dakota	2	0
Nebraska	2	29
Kansas	34	76
SO. ATL.		
Delaware	3	32
Maryland [3]	46	107
Dist. of Col	32	10
Virginia [1]	58	133
West Virginia	18	12
North Carolina [1]	156	136
South Carolina	28	24
SO. ATL.—continued		
Georgia [1]	29	22
Florida [1]	9	1
E. SO. CEN.		
Kentucky	57	122
Tennessee [1]	59	32
Alabama [1]	13	11
Mississippi [3]	----------	----------
W. SO. CEN.		
Arkansas [1]	20	15
Louisiana [1]	4	6
Oklahoma [4]	16	17
Texas [1]	69	76
MOUNTAIN		
Montana [4]	9	5
Idaho	16	8
Wyoming	12	1
Colorado	45	17
New Mexico	18	21
Arizona	14	9
Utah [3]	20	33
Nevada	0	0
PACIFIC		
Washington	106	94
Oregon	51	15
California	182	462
Total	3,822	4,310
48 weeks	194,995	155,280

[1] Typhus fever, week ended Nov. 29, 1941, 78 cases, as follows: New York, 1; Pennsylvania, 1; Virginia, 1; North Carolina, 4; Georgia, 30; Florida, 6; Tennessee, 2; Alabama, 10; Arkansas, 1; Louisiana, 11; Texas, 11.
[2] New York City only.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended Nov. 29, 1941, 2 cases, as follows: Oklahoma, 1; Montana, 1.

CONSOLIDATED MONTHLY STATE REPORTS FOR JULY, AUGUST, AND SEPTEMBER, 1941

Division and State	Actinomycosis	Chickenpox	Diphtheria	Dysentery, amoebic	Dysentery, bacillary	Dysentery, undefined	Encephalitis, epidemic or lethargic	German measles	Hookworm disease	Influenza	Malaria	Measles	Meningitis, meningococcus	Mumps	Ophthalmia neonatorum	Pellagra	Pneumonia, all forms	Poliomyelitis
NEW ENG.																		
Maine		220	3					62		1		444	2	404			30	22
New Hampshire		18	1	1				25		1	1	32	0	31	1		5	14
Vermont		104	1					81				256	0	179			1	6
Massachusetts	1	750	25	1	166		6	175			1	1,870	17	1,041	110	7	[1]336	117
Rhode Island		56	20		2		5	7			1	70	1	28			26	25
Connecticut		328	10	2	25		1	45		7		832	4	478			228	77
MID. ATL.																		
New York		1,760	73	17	871		36	1,168			27	3,528	63		[2]23		2,887	659
New Jersey		528	24	2	4		2	504		26	6	1,345	12	711	14		420	233
Pennsylvania		951	86	10	4		9	265		4	3	4,356	31	1,839	6		590	516
E. NO. CEN.																		
Ohio		645	66	2	44		9	53		47	8	1,824	10	308			531	330
Indiana		43	45	1				4		92	5	246	7	18	1		103	82
Illinois	3	649	152	20	47		[3]18	114		24	30	930	11	854	12		1,058	214
Michigan	1	868	32	20	106			159		7	14	1,534	5				536	170
Wisconsin		988	4	1			39			217	1	2,794	7	1,695			[1]65	37
W. NO. CEN.																		
Minnesota	8	282	32	11	7		522		2	18	3	74	3				103	176
Iowa	1	96	19		10		113	15		13	18	309	2	273		1	85	20
Missouri		43	75			62	3			20	28	407	5	138	1	1	152	22
North Dakota		81	13				1,069			80		133	1	18			81	7
South Dakota		31	74				194					27	1	64			31	14
Nebraska		34	9				52			3		69	0	26			2	12
Kansas		104	26	2	1		43	12		34	5	227	9	135		4	205	25
SO. ATL.																		
Delaware		10	1		1					1	1	35	1	24			7	10
Maryland		115	15	2	67	27	2	190		15	5	1,112	23	316	2	1	327	181
Dist. of Col.		27	10	2			1			3		180	2	42			85	47
Virginia		78	98	3	3,466					674	21	2,007	24	126		14	279	74
West Virginia		35	38		22					57	2	692	8	59		2	24	19

North Carolina		73	334		5			82		4	155	1,070	7			27	9	108
South Carolina		55	624	13			(4)	182	307	1,219	4,208	879	13	189	5	307	368	118
Georgia		23	202	20	186	18			1,426	152	471	578	3	96		57	168	633
Florida		26	36	7	4		1	8	1,213	122	51	109	4	114	3	3	176	149
E. SO. CEN.																		
Kentucky		61	80	3	235		2			3	10	356	11	104		6	74	153
Tennessee		32	99	6	157			30	7	156	228	460	16	105	5	48	409	315
Alabama		22	180	4			6	6		67	2,336	278	15	75	4	43	212	700
Mississippi		453	125	539	4,028				2,053	2,555	17,357	1,430	4	1,217	30	1,076	735	99
W. SO. CEN.																		
Arkansas		28	81	61	108		1	17	46	86	1,925	409	5	183	8	76	72	25
Louisiana		2	44	3	22				35	15	155	27	11	21	9	9	211	35
Oklahoma		21	65	5	175		6		2	148	857	238	1	106	4	15	114	15
Texas		279	301	146	1,628		34			4,228	3,633	966	11	823	30	496	1,196	49
MOUNTAIN																		
Montana	1	198	42		13		80	19		24	1	53	0	36			19	10
Idaho		29	1	1			2	4		2		29	1	27			3	3
Wyoming		39	9			2	26	3		29	1	38	4	20			9	4
Colorado		119	95	1	8		146			251	2	267	6	147			78	18
New Mexico		36	5	8	67		3	3		8	23	205	3	45		2	148	5
Arizona		52	10		70	214	23	22		335	14	404	2	140	4	18	174	4
Utah		410	1	1		1	1	103		26		79	0	162	1		46	23
Nevada		7		1						1		9	0	38			20	0
PACIFIC																		
Washington		476	0	4	11		30	121		31	5	79	6	638		1	52	40
Oregon		128	19	13	5		2			74	26	176	1	209			80	43
California		1,891	127	76	245		41	1,178		508	63	1,708	9	3,732	6		[1] 511	99
Total	15	13,304	3,441	1,009	11,817	354	2,528	4,717	5,091	11,418	31,701	35,300	382	17,034	274	2,214	13,081	5,766
Third quarter 1940	5	13,441	2,819	1,024	9,918	631	452	1,251	6,795	8,802	40,939	24,405	324	10,194	151	2,530	13,414	5,794
Alaska		32	1					188		595		47	2	42			37	1
Hawaii		76	19	7	59			72	12	30		157		46			[1] 20	6

[1] Lobar pneumonia only.
[2] Exclusive of New York City.
[3] 12 cases of unspecified type also reported.
[4] 1 case of unspecified type reported.

CONSOLIDATED MONTHLY STATE REPORTS FOR JULY, AUGUST, AND SEPTEMBER, 1941—Continued

Division and State	Puerperal septicemia	Rabies in animals	Rabies in man	Rocky Mountain spotted fever	Scarlet fever	Septic sore throat	Smallpox	Tetanus	Trachoma	Trichinosis	Tuberculosis, respiratory	Tuberculosis, all forms	Tularemia	Typhoid and paratyphoid fever	Typhus fever	Undulant fever	Vincent's infection	Whooping cough
NEW ENG.																		
Maine				0	39	1	0	1			93	112		11		12	14	264
New Hampshire				0	22	2	0					65		5		3		52
Vermont				0	23	1	0				6	10		13		15	11	75
Massachusetts		14		1	674	13	0	3		10	753	836		35		25		1,780
Rhode Island		1		0	45	3	0				92	369		4		2		351
Connecticut				0	112	28	0		1	2	291	301		15		32		499
MID. ATL.																		
New York		28		3	967	101	0	25		25	3,619	3,918		246	15	80	[2] 102	3,779
New Jersey		75		3	321	21	0	4		6		953		56		20		1,606
Pennsylvania				8	562		0	6				534	1	206		23		3,061
E. NO. CEN.																		
Ohio	5		1	8	719	17	1	6	5		1,404	1,445	5	149	1	33		4,010
Indiana		2		5	147		4				476	480	3	44		6		231
Illinois		97		11	667	4	13	8	65	4	2,091	2,459	9	157	1	84	33	2,405
Michigan		20	1	0	605	111	11	3		1		1,359	1	92		36	54	3,617
Wisconsin				0	538	14	9					293		18		35		2,938
W. NO. CEN.																		
Minnesota		4		0	218	26	2		2	1		593	9	11		36		806
Iowa		8		9	157	21	5	2			147	[5] 147	9	42		102		497
Missouri				9	203	10	11		103			652	19	124		16		486
North Dakota				0	21	2	0				86	93	4	5			10	253
South Dakota				1	66	4	6	1	6			47	1	8		5		152
Nebraska				0	74	5	1					21		3				144
Kansas		6		0	333	10	1	2			248	263	11	40		37	31	1,052
SO. ATL.																		
Delaware		3		1	44		0				58	[5] 58		4				28
Maryland		1		28	178	26	0	10			706	728		108	1	8	57	807
Dist. of Col.				4	64		0				453	474		8		1		206
Virginia				23	134	281	0	4			646	[5] 646	2	144	4	2		725
West Virginia				6	196	12	1					426		107		2		329
North Carolina				17	276	33	0		2		575	627	2	122	10	6	5	2,069
South Carolina		52	1	0	63	8	3	14				142	1	127	34	6		1,185

Georgia				2	143	81	1	5				453	10	211	335	30		286
Florida				0	32	3	0	3				261		61	84	7	7	201
E. SO. CEN.																		
Kentucky				8	302	23	1				424	430	9	214	1	10		885
Tennessee			2	6	259	33	4	11	7	1		984	17	189	7	15	18	591
Alabama		44		0	167		0	11	1			739	3	99	112	12		232
Mississippi	58			0	70		1		14		332	345	11	132	27	6		1,592
W. SO. CEN.																		
Arkansas	1	55		0	28	111	5	3	204	1	241	248	30	168		7		176
Louisiana		11		1	37	12	1	7			349	[5] 349	3	164	80	19		124
Oklahoma			1	8	101	94	2	1	341			395	17	111	2	43	24	200
Texas		7		1	202		1		45			712	17	434	402	104		1,965
MOUNTAIN																		
Montana				7	95	8	1			1		114	11	9		2	3	253
Idaho				1	39	11	1				6	[5] 6	5	9		1		205
Wyoming				18	10	13	0					29	27	3		3		205
Colorado				5	129	10	1				205	[5] 295		33		14		1,419
New Mexico	3	36		0	15	4	0	1			236	248		50		2		330
Arizona				0	16		2		202			278		14		4		232
Utah				5	25	8	0		1		39	60	20	17		2		620
Nevada				0		1	0					11	4	3		1	12	62
PACIFIC																		
Washington		21		4	142	9	0	2	6		398	469	1	33		8	7	1,015
Oregon		7		3	71	6	2		1			164	10	33		9	8	328
California		98		2	569	28	2	22	21	18	2,217	2,330	8	95	6	74		4,372
Total	67	590	6	208	9,980	1,209	93	155	1,117	70	16,281	26,980	280	3,986	1,122	1,000	396	48,760
Third quarter 1940	115	559	10	202	11,559	1,544	269	140	1,187	91	15,265	27,201	280	4,831	694	978	486	42,235
Alaska					1	18					167	187						15
Hawaii					2			6		6	180	193		6	24			198

[5] Respiratory only.

Anthrax: Massachusetts, 1; New York, 4; New Jersey, 1; Pennsylvania, 13; Iowa, 2; South Dakota, 1; West Virginia, 1; Louisiana, 3; Texas, 2.
Colorado tick fever: Wyoming, 1.
Dengue: South Carolina, 6; Alabama, 1; Arkansas, 1; Louisiana, 6; Oklahoma, 1; Texas, 152; Arizona, 1.
Diarrhea: Ohio, 954 (under 2 years; enteritis included); Michigan, 10 (infant diarrhea); Maryland, 116; South Carolina, 5,347; New Mexico, 30 (enteritis included); Nevada, 9 (infant diarrhea).
Enteritis: Kansas, 3; Washington, 51 (under 2 years, 22; over 2 years, 29).
Food poisoning: Illinois, 7; Louisiana, 25; New Mexico, 1; Nevada, 4; California, 240.
Granuloma, coccidioidal: California, 6.
Leprosy: Hawaii Territory, 7; Rhode Island, 1; New York, 4; Pennsylvania, 1; Louisiana, 4; Texas, 3; Washington, 1; California, 3.
Plague: California, 1.
Relapsing fever: Texas, 10; New Mexico, 1; California, 5.
Weil's disease: Hawaii Territory, 1; Michigan, 9; Maryland, 1; Washington, 3.

WEEKLY REPORTS FROM CITIES

City reports for week ended Nov. 15, 1941

This table lists the reports from 135 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	1	6	0	0	0	0	27
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	1	15
Manchester	0	------	0	0	0	11	0	0	0	0	13
Nashua	0	------	0	2	0	1	0	0	0	5	6
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	0	------	0	12	11	25	0	8	0	16	205
Fall River	1	------	0	0	0	8	0	0	0	0	25
Springfield	0	------	0	3	1	16	0	2	0	7	34
Worcester	0	------	0	1	6	10	0	0	0	7	52
Rhode Island:											
Pawtucket	0	------	0	0	0	5	0	0	0	0	16
Providence	1	------	0	6	1	3	0	1	0	12	53
Connecticut:											
Bridgeport	0	------	0	3	1	9	0	2	2	7	36
Hartford	0	------	0	3	2	2	0	0	0	0	45
New Haven	0	------	0	8	3	4	0	1	0	2	39
New York:											
Buffalo	0	------	2	2	7	6	0	6	0	10	133
New York	8	5	0	13	52	64	0	81	2	294	1,454
Rochester	0	------	0	0	0	4	0	1	0	6	63
Syracuse	0	------	0	0	3	3	0	0	0	19	51
New Jersey:											
Camden	0	------	0	0	0	0	0	0	1	6	42
Newark	0	------	0	2	7	10	0	3	0	50	92
Trenton	0	------	0	1	4	6	0	3	0	2	39
Pennsylvania:											
Philadelphia	2	1	1	4	11	52	0	20	0	33	453
Pittsburgh	4	2	1	0	7	13	0	5	3	9	142
Reading	0	------	0	0	0	0	0	1	0	7	28
Scranton	1	------	------	1	0	0	0	------	0	0	------
Ohio:											
Cincinnati	1	1	0	0	6	13	0	6	0	13	147
Cleveland	0	13	0	1	11	20	0	3	1	26	185
Columbus	2	------	0	0	2	8	0	3	0	3	79
Toledo	1	------	0	0	2	3	0	3	0	14	69
Indiana:											
Anderson	0	------	0	0	1	1	0	0	0	1	10
Fort Wayne	0	------	0	0	3	1	0	2	0	0	29
Indianapolis	5	------	1	1	8	16	0	5	0	13	87
Muncie	0	------	0	0	2	2	0	0	0	3	12
South Bend	0	------	0	0	0	0	0	0	0	0	13
Terre Haute	0	------	0	0	1	0	0	0	0	0	16
Illinois:											
Alton	0	------	0	0	1	1	0	0	0	3	11
Chicago	17	4	0	14	25	53	0	29	0	118	704
Elgin	0	------	0	0	1	0	0	0	0	4	15
Moline	0	------	0	0	1	0	0	0	0	15	12
Springfield	0	------	0	0	0	6	0	0	0	0	18
Michigan:											
Detroit	5	------	1	7	11	76	0	15	0	54	274
Flint	0	------	0	0	4	4	0	0	0	1	39
Grand Rapids	0	0	0	3	0	0	0	0	0	3	29
Wisconsin:											
Kenosha	0	------	0	0	0	4	0	0	0	4	7
Madison	0	------	0	2	0	1	0	0	0	0	15
Milwaukee	0	------	0	8	1	18	0	6	0	77	80
Racine	0	------	0	2	1	5	0	0	0	12	22
Superior	0	------	0	1	0	0	0	0	0	4	4
Minnesota:											
Duluth	0	------	0	0	0	1	0	0	0	0	23
Minneapolis	1	------	1	2	6	6	0	0	0	22	111
St. Paul	0	------	0	1	2	5	0	2	0	21	63

City reports for week ended Nov. 15, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	----	----	0	----	1	0	----	0	0	----
Davenport	0	----	----	0	----	1	0	----	0	0	----
Des Moines	2	----	0	0	0	3	0	0	0	0	42
Sioux City	0	----	----	0	----	0	0	----	0	1	----
Waterloo	0	----	----	0	----	0	0	----	0	2	----
Missouri:											
Kansas City	0	----	1	2	5	7	0	5	0	6	107
St. Joseph	0	----	0	3	3	5	0	0	0	0	23
St. Louis	3	3	0	1	12	21	1	8	0	5	203
North Dakota:											
Fargo	0	----	0	0	1	1	0	0	0	0	10
Grand Forks	0	----	----	0	----	0	0	----	0	0	----
Minot	0	----	0	21	0	0	0	0	0	2	4
South Dakota:											
Aberdeen	0	----	----	0	----	2	0	----	0	1	----
Sioux Falls	0	----	0	0	0	0	0	0	0	0	8
Nebraska:											
Lincoln	0	----	----	1	----	0	0	----	0	1	----
Omaha	0	----	0	2	5	0	0	1	0	1	50
Kansas:											
Lawrence	0	----	0	0	0	0	0	0	0	0	9
Topeka	0	----	0	0	1	5	0	1	0	9	21
Wichita	0	----	0	2	2	7	0	0	0	5	37
Delaware:											
Wilmington	0	----	0	0	3	8	0	0	0	0	29
Maryland:											
Baltimore	2	6	2	27	11	24	0	5	0	22	208
Cumberland	0	----	0	1	0	1	0	0	0	0	13
Frederick	0	----	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	1	1	1	1	5	17	0	10	0	21	154
Virginia:											
Lynchburg	1	----	0	0	3	2	0	0	0	0	13
Norfolk	2	----	0	0	0	2	0	0	0	0	17
Richmond	2	----	1	0	2	6	0	1	0	0	44
Roanoke	1	----	0	0	0	0	0	0	0	2	20
West Virginia:											
Charleston	0	----	0	0	0	0	0	0	0	0	20
Huntington	2	----	----	1	----	0	0	----	0	0	----
Wheeling	0	----	0	10	2	0	0	0	0	2	22
North Carolina:											
Gastonia	0	----	----	0	----	0	0	----	0	0	----
Raleigh	0	----	0	1	1	0	0	2	0	0	10
Wilmington	4	----	0	3	1	0	0	0	0	6	14
Winston-Salem	4	----	0	83	2	3	0	1	0	0	13
South Carolina:											
Charleston	1	25	0	0	3	0	0	0	1	2	20
Florence	0	----	0	0	0	0	0	0	0	1	5
Greenville	0	----	0	0	0	1	0	0	0	0	22
Georgia:											
Atlanta	1	5	0	0	4	9	0	11	0	0	91
Brunswick	0	----	0	0	0	0	0	0	0	0	3
Savannah	0	1	0	3	1	0	0	2	1	0	40
Florida:											
Miami	0	----	0	0	0	1	0	0	0	1	36
St. Petersburg	0	----	0	0	0	0	0	0	0	1	24
Tampa	1	----	0	0	1	0	0	0	0	0	19
Kentucky:											
Ashland	0	----	0	0	1	1	0	0	0	6	10
Lexington	0	----	0	0	0	0	0	1	0	1	15
Louisville	0	----	0	0	4	14	0	1	0	37	64
Tennessee:											
Knoxville	1	1	0	0	1	2	0	0	0	4	19
Memphis	1	----	1	1	3	6	0	4	0	7	75
Nashville	0	----	0	0	5	6	0	1	0	2	50
Alabama:											
Birmingham	2	7	1	0	2	7	0	6	1	1	70
Mobile	3	----	0	1	2	0	0	0	0	0	28
Montgomery	0	5	----	0	----	0	0	----	0	0	----
Arkansas:											
Fort Smith	0	----	----	0	----	0	0	----	0	0	----
Little Rock	1	7	0	0	2	0	0	3	0	0	35
Louisiana:											
Lake Charles	1	----	0	0	2	0	0	0	0	0	8
New Orleans	1	10	3	0	12	2	0	10	0	2	153
Shreveport	0	2	0	0	6	0	0	2	1	1	32

City reports for week ended Nov. 15, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	6	0	0	4	1	0	1	0	0	34
Tulsa	4	------	0	30	0	2	0	0	0	0	19
Texas:											
Dallas	6	------	0	2	1	3	0	1	0	3	74
Fort Worth	1	------	0	1	1	5	0	1	0	2	28
Galveston	0	------	0	0	0	1	0	1	0	0	7
Houston	2	------	0	2	9	2	0	4	0	1	74
San Antonio	0	21	1	0	6	4	0	11	0	4	69
Montana:											
Billings	0	------	0	0	1	2	0	0	0	0	6
Great Falls	0	------	0	3	0	0	0	0	0	4	4
Helena	0	------	0	1	0	0	0	0	0	6	1
Missoula	0	------	0	0	2	0	0	0	0	0	6
Colorado:											
Colorado Springs	0	------	0	1	0	5	0	2	0	0	14
Denver	7	11	2	9	4	4	0	0	0	32	76
Pueblo	0	------	0	20	1	1	0	0	0	0	9
New Mexico:											
Albuquerque	0	------	0	2	0	0	0	3	0	2	9
Arizona:											
Phoenix	2	32	------	0	------	0	0	------	0	0	------
Utah:											
Salt Lake City	1	------	0	2	0	2	0	1	0	3	28
Washington:											
Seattle	0	------	0	0	2	1	0	4	0	42	93
Spokane	0	1	1	0	4	2	0	0	0	3	35
Tacoma	0	------	0	0	1	0	0	0	0	8	29
Oregon:											
Portland	1	------	0	3	4	3	0	0	0	2	64
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	5	15	3	32	3	17	0	16	2	28	346
Sacramento	2	------	0	0	2	1	0	2	0	0	35
San Francisco	0	6	0	2	5	4	0	5	0	4	165

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Boston	3	0	1	Baltimore	0	0	1
New York:				District of Columbia:			
New York	2	1	3	Washington	0	0	2
Rochester	0	0	1	Virginia:			
Pennsylvania:				Lynchburg	0	0	1
Philadelphia	2	0	1	West Virginia:			
Pittsburgh	0	0	2	Wheeling	0	1	0
Ohio:				North Carolina:			
Cincinnati	0	0	4	Wilmington	0	0	1
Cleveland	0	0	1	Tennessee:			
Indiana:				Memphis	0	0	1
Indianapolis	0	0	1	Nashville	0	0	6
Illinois:				Oklahoma:			
Chicago	0	0	4	Tulsa	0	0	2
Springfield	0	0	1	Montana:			
Michigan:				Great Falls	0	0	1
Detroit	0	0	1	Arizona:			
Minnesota:				Phoenix	0	0	1
Minneapolis	0	0	2	Utah:			
Missouri:				Salt Lake City	0	0	1
St. Louis	0	0	3	California:			
Delaware:				Los Angeles	1	0	1
Wilmington	0	0	1				

Dengue.—Cases: Charleston, S. C., 3; San Antonio, 2.
Encephalitis, epidemic or lethargic.—Cases: New York, 2. Deaths: Grand Rapids, 1.
Pellagra.—Cases: Louisville. 1.
Typhus fever.—Cases: New York, 1; Charleston, S. C., 1; Atlanta, 3; Savannah, 3; Miami, 1; Tampa, 1; Nashville, 1; Birmingham, 2; Montgomery, 1; Dallas, 1; Houston, 3. Deaths: Terre Haute, 1.

Rates (annual basis) per 100,000 population for a group of 89 selected cities (population, 1940, 33,902,982)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet-fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
Week ended Nov. 15, 1941	15.23	22.61	3.69	47.37	52.29	101.20	0.15	49.68	2.31	167.80
Average for week, 1936–40	23.63	18.81	4.82	115.34	69.17	128.71	.78	49.12	4.97	170.68

PLAGUE INFECTION IN GROUND SQUIRRELS AND FLEAS FROM GROUND SQUIRRELS IN KERN AND SISKIYOU COUNTIES, CALIF.

Under date of November 17, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in organs from 10 ground squirrels, *C. fisheri*, submitted to the laboratory on October 30 from a ranch 2 to 4 miles east of Lebec, Kern County, Calif., and in a pool of 160 fleas from 3 ground squirrels, *C. douglasii*, submitted to the laboratory on September 18 from a location ½ mile north and 1 mile west of Mount Shasta City, Siskiyou County, Calif.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended October 25, 1941.—During the week ended October 25, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	1	1	2	4	1			1	11
Chickenpox		9		160	145	34	62	11	47	468
Diphtheria		13	3	55	4	3	7			85
Dysentery				33						33
Influenza		16			6				27	49
Lethargic encephalitis						1	[1] 4			5
Measles				402	46	5	10	2	9	474
Mumps		1		251	45	34	32	10	15	388
Pneumonia		4			4		4		3	15
Poliomyelitis			11	1	1	2		1	1	17
Scarlet fever		10	16	137	132	20	10	20	8	353
Tuberculosis	3	14	3	59	44		1	1		125
Typhoid and paratyphoid fever		1		33	4		9	1	2	50
Whooping cough		18	3	115	115				49	300

[1] Encephalomyelitis.

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended March 29, 1941.—During the 13 weeks ended March 29, 1941, cases of certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	14,430	Puerperal pyrexia	1,861
Dysentery	1,747	Scarlet fever	16,144
Ophthalmia neonatorum	971	Typhoid and paratyphoid fever	227
Pneumonia	20,336		

England and Wales—Vital statistics—First quarter 1941.—The following vital statistics for the first quarter of 1941 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar-General and are provisional:

	Number	Annual rate per 1,000 population		Number	Annual rate per 1,000 population
Live births	147,020	14.4	Deaths under 1 year of age	10,985	[1] 75
Stillbirths	5,615	.55	Deaths from diarrhea (under 2 years)	761	[1] 5.2
Deaths, all causes	178,647	17.5			

[1] Per 1,000 live births.

NOTE.—All deaths are of civilians only.

England and Wales—Vital statistics—Year 1940.—The following vital statistics for the year 1940 for England and Wales are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar-General and are provisional:

	Number	Annual rates per 1,000 population		Number	Annual rates per 1,000 population
Live births	607,029	14.6	Deaths from—Continued		
Stillbirths	22,731	.55	Influenza	11,420	
Deaths, all causes	572,644		Measles	855	
Deaths under 1 year of age	33,892	[1] 56	Scarlet fever	152	
Deaths from:			Typhoid and paratyphoid fever	127	
Diarrhea and enteritis (under 2 years of age)	2,893	[1] 4.8	Whooping cough	678	
Diphtheria	2,466				

[1] Per 1,000 live births.

NOTE.—All deaths are of civilians only.

MALTA

Communicable diseases—August 1941.—During the month of August 1941, certain communicable diseases were reported in Malta (including the Island of Gozo) as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	1		Scarlet fever	2	
Diarrhea and enteritis		216	Tuberculosis	35	12
Diphtheria	16	2	Typhoid and paratyphoid fever	52	3
Influenza	8		Undulant fever	85	1
Measles	4		Whooping cough	129	6
Poliomyelitis		1			

SWEDEN

Notifiable diseases—August 1941.—During the month of August 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	4	Poliomyelitis	75
Diphtheria	8	Scarlet fever	503
Dysentery	183	Syphilis	18
Epidemic encephalitis	2	Typhoid fever	21
Gonorrhea	1,079	Undulant fever	5
Paratyphoid fever	118	Weil's disease	3

SWITZERLAND

Notifiable diseases—August 1941.—During the month of August 1941, cases of certain notifiable diseases were reported in Switzerland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	13	Paratyphoid fever	5
Chickenpox	80	Poliomyelitis	213
Diphtheria	75	Scarlet fever	191
Dysentery	2	Trachoma	1
German measles	9	Tuberculosis	267
Influenza	4	Typhoid fever	4
Measles	168	Undulant fever	15
Mumps	37	Whooping cough	147

Zurich—Poliomyelitis.—For the period June 29 to September 6, 1941, a total of 63 cases of poliomyelitis was reported in Zurich, Swit-

zerland. For the period September 7 to October 18, 1941, a total of 201 cases was reported, by weeks, as follows:

Week ended—	No. of cases
September 13	35
September 20	47
September 27	40
October 4	28
October 11	27
October 18	24

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE —Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year All reports of yellow fever are published currently

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month

Plague

Brazil.—For the months of January to October 1941, inclusive, a total of 118 confirmed cases of plague was reported in Brazil, by States, as follows: January—Alagoas, 5 cases; Pernambuco, 20; Rio de Janeiro, 2. February—Alagoas, 9; Pernambuco, 16. March—Alagoas, 3; Pernambuco, 16. April—Alagoas, 5; Bahia, 1; Pernambuco, 5. May—Alagoas, 6; Bahia, 2; Pernambuco, 2. June—Alagoas, 5. July—Bahia, 2. August—No cases reported. September—Bahia, 3; Pernambuco, 5. October—Alagoas, 3; Bahia, 2; Pernambuco, 6.

Indochina (French)—Cambodia.—For the period November 1–10, 1941, 1 case of plague was reported in Cambodia, French Indochina.

Typhus Fever

Chile.—During the period March 30 to June 14, 1941, 110 cases of typhus fever with 10 deaths were reported in Chile.

Yellow Fever

Gold Coast—Northern Territories.—On October 17, 1941, 1 case of yellow fever with 1 death was reported in the Northern Territories of the Gold Coast.

Ivory Coast—Batende Region.—A report dated November 22, 1941, stated that 1 suspected case of yellow fever occurred in the Batende Region, Ivory Coast.

Sudan (French).—A report dated November 7, 1941, stated that 3 cases of yellow fever were reported in Bamako, French Sudan. Information dated November 22, 1941, stated that 1 suspected case of yellow fever with 1 death was reported in Bamako.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

THE PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

150TH ANNIVERSARY OF THE BILL OF RIGHTS

DECEMBER 15, 1941

Freedom of speech
Freedom of press
Freedom of religion
Freedom of assembly
Equal justice to all

A NOBLE HERITAGE AND A SACRED TRUST

The American Bill of Rights was ratified on December 15, 1791. The Sesquicentennial Anniversary is celebrated throughout the Nation in accordance with a Joint Resolution of Congress and a Proclamation of the President.

Public Health Reports

VOLUME 56 DECEMBER 12, 1941 NUMBER 50

IN THIS ISSUE

U.S. PUBLIC HEALTH SERVICE 1798

CONTENTS

Public Health Reports

Vol. 56 • DECEMBER 12, 1941 • *No. 50*

CHILD HEALTH AND THE SELECTIVE SERVICE PHYSICAL STANDARDS[1]

By ANTONIO CIOCCO, *Biometrician*, HENRY KLEIN, *Dental Officer*, and CARROLL E. PALMER, *Passed Assistant Surgeon, United States Public Health Service*

INTRODUCTION

Complacency about the Nation's health engendered in late years by emphasis on the declining mortality and the so-called increase in longevity received something of a shock recently when the results of physical examinations of selectees were made public. The current finding that approximately half of the men examined are rejected because of various defects may perhaps indicate no real deterioration of health, but as Perrott[2] has pointed out, "Neither can it be said that the health of young men has improved" since World War I. The immediate reaction based on the exigencies of the moment has been to consider the "rehabilitation" of men found defective. However, in keeping with the objectives of modern medical science it is appropriate to inquire into the possibility of preventing the conditions which lead to disqualification of men as soldiers. The military health requirements spring from the need for men who can function efficiently under arduous circumstances, and, while for civilian life such requirements may seem very stringent and even unnecessary, it would appear beneficial to adjust our standards of civilian good health so that such requirements will be met more frequently in the future.

To develop means of preventing disqualifying conditions it is first necessary to learn how early and in what manner such conditions can be detected and it is with that aspect of the problem that the present report is concerned. Specifically, this paper describes the physical status of a sample of selectees as observed 15 years ago, when the men were school children, and compares these findings for selectees who

[1] From the Division of Public Health Methods, National Institute of Health.

[2] Perrott, George St. J.: Physical status of young men, 1918 and 1941. Milbank Memorial Fund Quarterly, 19: 343 (October 1941).

have now been accepted for military duty with similar observations on selectees who have now been disqualified (temporarily or permanently) because of physical or mental disability.

MATERIAL

Sources of data for the present report include:

1. The records of physical examinations of Hagerstown, Md., white school children made by the United States Public Health Service during the period 1922–1928.

2. Information regarding the acceptance or rejection of white selectees who appeared before the physicians of the local Draft Boards Nos. 1 and 2 of Washington County, Md.[3]

For each selectee about whom the results of physical examination were obtained a search was made in the Hagerstown files of the Child Hygiene Office to determine whether or not he had ever been examined during the school surveys made by the medical officers of the United States Public Health Service. Of the 697 selectees examined by local Draft Board No. 1 and on whom information as to the results are available, 363 (52 percent) were found to have received some type of physical examination when in school. Of the 759 selectees examined by local Draft Board No. 2 the records of only 48 (6 percent) were identified in the files. The difference between the two local boards with respect to the proportion of selectees who at one time had been examined by the United States Public Health Service is due to the fact that Board No. 1 deals with residents of the city of Hagerstown, while No. 2 covers the rest of Washington County. The school surveys were conducted only in some of the Hagerstown schools.

The records of the past and present physical status of 411 selectees thus constitute the material for this study. However, owing to circumstances related to the schools selected for survey in 1922–1928, the age and grade of the selectees at the time, and the kind of physical examination made, not all past records of the 411 selectees are complete.

Of the 411 selectees, 225 (54.7 percent) were rejected (i. e., placed in Class I–B or IV–F, because of some defect), a rejection percentage only slightly higher than that observed for the country at large. The higher rejection rate probably reflects local conditions since, of the sample of 1,446 Washington County selectees (the total on whom information as to acceptance or rejection is at hand), 20 have been rejected because of illiteracy and 742 for physical or mental conditions. For this sample of the county the rejection rate because of physical and mental defects is, therefore, 52 percent.

The frequency of the several causes of rejection of the 225 selectees placed in Class I–B or IV–F is summarized in table 1 and compared

[3] The writers wish to express their appreciation of the cooperation and assistance kindly given by Mr. W. A. Tobias of Selective Service of Washington County, Md.

with the percentages for the sample from the entire county and with those reported by the Director of the Selective Service System (October 10, 1941) for the country as a whole.

TABLE 1.—*Causes of rejection among a sample of Washington County, Md., selectees*

Causes of rejection	This sample of selectees		Washington County sample	United States selectees (Oct 10, 1941)
	Number	Percent	Percent	Percent
Dental defects	62	27.6	31.3	20.9
Defective eyes	23	10.2	10.4	13.7
Cardiovascular diseases	28	12.4	11.5	10.6
Venereal diseases	10	4.4	3.8	6.3
Mental and nervous diseases	16	7.1	11.7	6.3
Hernia	33	14.7	6.2	7.1
Defects of ears	15	6.7	6.6	4.6
Defects of feet	7	3.1	1.5	4.0
Defective lungs, including tuberculosis	7	3.1	3.8	2.9
Other and miscellaneous	24	10.7	12.3	24.5
Total	225	100.0	100.0	100.0

From table 1 it appears that, relative to the frequency of the majority of conditions listed, the findings for the sample of this study and for the entire county differ but little from those of the United States as a whole. However, of this sample, only 10.7 percent were rejected because of conditions included under the heading, "Other and miscellaneous," while for the country as a whole the corresponding percentage is 24.5. While this difference may reflect local peculiarities with respect to health, it may also result from a lack of uniformity in classifying causes of rejection when this is the result of more than one condition. As will be seen, in the official published statistics as well as in the data of the above tabulation, the percentages of men rejected for specific conditions do not reflect the actual prevalence of those conditions because only one cause is assigned for each rejection.

CAUSE OF REJECTION VS. PHYSICAL STATUS IN CHILDHOOD

The main purpose of this inquiry was to determine whether in childhood there were appreciable indications of the defects that have brought about the present disqualification of selectees. For this purpose an attempt has been made to compare, for each disqualifying cause, the childhood status of men who were rejected because of this cause with that of men who successfully passed the physical examination.

Dental defects.—Defective dentition is by far the most frequent cause of rejection; 62 out of 225 (27.6 percent) were rejected because of this defect. But, in addition, the records of Selective Service physical examinations show that 26 men rejected for other causes

also had defective dentition as defined by Selective Service standards. Of these 88 men, records of one or more dental examinations made by the United States Public Health Service during 1922–1928 were found for 57. Records of a similar dental examination are available for 146 of the 186 selectees placed in Class I–A. The results of the school examination relative to the permanent teeth of both groups of men are summarized in table 2.

TABLE 2.—*Dental status observed in school children who 15 years later were selectees placed in Class I–A, and in Class I–B or IV–F because of dental defects, alone or associated with other conditions*

Age at school examination	Number of children		Percentage of children with 1 or more decayed, missing, or filled (DMF) permanent teeth		Decayed, missing, or filled (DMF) permanent teeth per 100 children	
	Selective Service classification		Selective Service classification		Selective Service classification	
	I–A	I–B or IV–F	I–A	I–B or IV–F	I–A	I–B or IV–F
6–7	26	6	50.0	100.0	92	233
8–9	61	22	70.5	90.9	211	319
10–11	32	16	87.5	100.0	300	450
12–13	24	8	79.2	100.0	354	688
14 and over	3	5	100 0	100.0	400	1,000
All children	146	57	72.6	96.5	238	456

In table 2 the following points are pertinent:

1. The mean age at school examination was slightly under 10 years. Hence, on the average, the findings apply to conditions existing 15 years before the examination for Selective Service.

2. At that time almost all (95.5 percent) of the children who later were to be rejected already had one or more decayed, missing, or filled permanent teeth; but in fewer (73 percent) of the children later to be accepted was such a condition present.

3. At the school examination, the number of decayed, missing, or filled permanent teeth per 100 children was twice as high among those children later rejected by the draft board physicians as among those placed in Class I–A. The difference is apparent at all examination ages.

Thus, it appears that men found to have defective dentition according to Selective Service standards had in childhood demonstrated a caries experience rate double that of men who passed the Selective Service physical examination. At the school examination each child who, as an adult, was rejected had on the average 4.6 permanent teeth either decayed, missing, or filled, while each accepted man had in childhood only 2.4 such teeth. To complete further the picture of the differences in childhood dental status of the two groups of selectees it may be noted that at that time among the rejected selectees there were recorded 26.3 missing permanent teeth per 100 children while among the accepted only 4.8 such teeth were found. Not only was the caries experience rate in childhood higher among rejected selectees

but apparently the frequency with which decayed teeth had been filled was lower than among children later to be accepted by the Selective Service physicians. Of the decayed, missing, and filled teeth of the rejected group the percentage of filled teeth was 6.9; the corresponding percentage for the accepted group was 16.0.

These findings lead to the conclusion that the selectees rejected or rejectable because of dental defects were in childhood markedly differentiated as a group from children who 15 years later were accepted according to the Selective Service standards. Differentiating characteristics were the higher caries experience, the larger number of teeth lost, and the smaller number of teeth filled among the rejected men. All these were appreciable in early childhood.

Eye defects.—In the sample of 225 rejected selectees there are 23 for whom the primary cause of disqualification was defective vision. In addition to these 23, the Selective Service physical examinations reveal that 26 other selectees disqualified for causes other than eye defects also had defective vision as defined by Selective Service standards. The school physical examinations made from 1922 to 1928 included a Snellen test, records of which are available for 33 of the 49 selectees rejected or rejectable because of defective vision. Records of a Snellen test given in school are also available for 150 of the 186 selectees placed in Class I–A. A comparison of the results observed in the two groups approximately 15 years before examination for Selective Service is summarized in table 3.

TABLE 3.—*Visual acuity without glasses (Snellen test) of school children who 15 years later were selectees placed in Class I–A, or Classes I–B and IV–F because of defective eyes, alone or associated with other defects*

	Classes assigned following Selective Service physical examination	Vision (Snellen test)			
		10/10	9/10 to 6/10	5/10 or less	All
Right eye:					
Number	I–A	105	39	6	150
	I–B or IV–F	9	10	14	33
Percent	I–A	70.0	26.0	4.0	100.0
	I–B or IV–F	27.3	30.3	42.4	100 0
Left eye:					
Number	I–A	103	44	3	150
	I–B or IV–F	11	13	9	33
Percent	I–A	68.7	29.3	2.0	100.0
	I–B or IV–F	33.3	39.4	27.3	100 0
Eye with poorer vision:					
Number	I–A	97	45	8	150
	I–B or IV–F	6	11	16	33
Percent	I–A	64.7	30.0	5.3	100 0
	I–B or IV–F	18.2	33.3	48.5	100 0

The data of table 3 reveal that:

1. At school examination, 70 percent of the selectees of Class I–A demonstrated a visual acuity of 10/10, by the Snellen test, for the right eye; 69 percent for the left eye; and 65 percent for both eyes. Among selectees who later had defective vision, the corresponding percentages are 27, 33, and 18.

2. At school examination 15 years ago, 42 percent of the selectees now disqualified because of vision were found to have visual acuity of 5/10 or less in the right eye; 27 percent in the left eye; and a total of 49 percent were so affected in at least one eye. Among the men placed in Class I–A such low visual acuity was observed in the right eye among 4 percent, in the left among 2 percent, and in only 5 percent did either of the eyes show such poor visual acuity.

As in the case of dental defects, the records of the visual acuity examination made 15 years before that for Selective Service apparently demonstrate that already in childhood boys who later were rejected or rejectable because of defective eyes had, as a group, markedly inferior vision as compared with that of boys who now are in Class I–A.

Cardiovascular diseases.—Of the 27 selectees disqualified because of some impairment of the cardiovascular system, records of school physical examinations and medical histories were available for 20. At the time of the school examination some form of cardiac abnormality was recorded for 7, or about one-third of the 20 men. Loud murmurs were noted for 3, including 1 whose heart was said to be enlarged. A fourth was alleged to have "heart disease"—without further elucidation—and tachycardia was reported for a fifth. There was a history of rheumatic fever for 2 other selectees. Among the 149 selectees in Class I–A for whom childhood physical examination records are available, none was stated to have any involvement of the cardiovascular system at the time of the school examination.

Since we are dealing with a relatively small sample, perhaps too much weight should not be attached to the fact that 7 of 20 young adults rejected for heart disease had, as children, some manifestation of rheumatic fever or cardiac symptom at the examination made in school, while no such sign was observed at the corresponding examination of the present-day selectees of Class I–A. However, it must be recalled that, as is usually the case in school examinations, none of the records is sufficiently descriptive to give detailed information regarding the actual status of the heart muscle and function at the time.

Defects of ears.—Among the 15 men disqualified for "defects of ears," the Selective Service examination uncovered 2 with a hearing impairment only, 1 with an atresia of the external auditory canal, and 12 with a perforated tympanic membrane. For these 12, the school examination records 15 years earlier revealed a discharging ear in 4 cases and a scarring of the tympanic membrane in 1. Obviously, in the school record of the selectee with atresia of the external auditory canal this defect was noted. However, hearing impairment was not indicated in the school records of the two men rejected because of this defect. Among 150 selectees placed in Class I–A the school examination records revealed no abnormality of the tympanic membrane in 147. One child was found to have a discharging ear; 2 a scarred tympanic membrane.

Defective lungs, including tuberculosis.—Of the 7 selectees rejected for this group of causes, a record of the usual chest examination made on school children was available for 5. All were reported as being "negative" at the time. Similarly, all of the 149 selectees in Class I–A were negative for these conditions at the time of school examination. It should be noted, however, that neither a tuberculin test nor an X-ray was included in the school examination.

Venereal diseases, hernia, mental and nervous diseases, defects of feet, other and miscellaneous.—Comparable information regarding the prevalence of these conditions is not included in the school examination record. Of course, because of the age incidence of venereal diseases, data on that point could not be expected. However, the lack of information about the other conditions reflects the *modus operandi* of physicians when examining school children.

Summarizing the above findings it appears that, relative to dental and visual defects as defined by Selective Service standards, the selectees exhibiting these defects were, as a group, already stigmatized by them 15 years earlier. Apparently the same is true with respect to cardiovascular diseases and ear defects but the small sample and the absence of precise information from the school examination does not permit any definitive conclusion. The lack of comparable school examination data prevents any attempt to determine whether the selectees rejected or rejectable for other defects were characterized by the same defects in childhood.

CHILDHOOD WEIGHT AND CHILDHOOD STATUS OF TONSILS, NUTRITION, AND POSTURE AMONG ACCEPTED AND REJECTED SELECTEES

There are certain physical traits that have traditionally been regarded as indicative of the state of health of children and on which great emphasis is often placed in the medical examination of school children. Among such signs, body weight and the condition of the pharyngeal tonsils are considered of particular importance. It, therefore, seems appropriate to examine whether any relationship exists between the results of the Selective Service physical examination and these aspects of physical condition as observed 15 years earlier at the school examination.

Weight.—Weight records are available for 364 selectees who were examined as school children between 1922 and 1928. For each age a "middle range of weight" (i. e., the range within which the middle 50 percent of the observations fall) has been computed. This range is 43–54.9 pounds for children 6–7 years old, 52–64 pounds for 8–9-year-old children, 65–74 pounds for the children 10–11 years old, 75–95 pounds for the children 12–13 years old, and 90–120 pounds

for children 14 years and over at the time of school examination. Combining all ages, the numbers of selectees whose weight, in school, fell below the middle range for the age group, within it, and above it, are shown in table 4.

TABLE 4.—*Weight in school years 1932–28 and results of Selective Service physical examination approximately 15 years later*

Weight as school children	Selectees			Percent I-B or IV-F among all selectees
	Total number	Class I-A	Class I-B or IV-F	
Below middle range for age	88	35	53	60 3
Middle range for age	189	85	104	55 1
Above middle range for age	87	48	39	44 8

The data of table 4 indicate that 60 percent of selectees who as children were below the middle range in weight were rejected, whereas among selectees who had been above this range at the time of school examination only 45 percent were rejected. Considering the differences in the percentage of rejections in the three groups, it would appear that with increase in childhood weight relative to age, chances of rejection as a selectee diminish.

Nutritional state.—The physician's judgment on the state of nutrition was found on the school examination records of 323 selectees. Of 232 whose nutritional state was considered good or excellent, 47.5 percent were rejected for military service 15 years later. However, among 91 children whose nutrition was regarded as fair to poor, 70.3 percent were later found unacceptable for Selective Service. Such a large difference between the two percentages would seem to indicate that the childhood state of nutrition was definitely associated with the development of defects that 15 years later disqualified the adult for Selective Service.

Posture.—At the time of school examination 132 of the selectees were judged by the physician as having good posture. Of these, 60.5 percent were 15 years later placed in Class I-A and 39.5 percent in Class I-B or IV-F. On the other hand, among the 168 selectees who in childhood were regarded as exhibiting fair or poor posture only 38.3 percent were placed in Class I-A and 61.4 percent in Class I-B or IV-F. Posture in childhood would also seem to be associated with the adult development of defects as defined by Selective Service standards.

Tonsils.—Records are available on the childhood condition of the tonsils of 147 selectees in Class I-A and of 159 in Classes I-B and IV-F. The results are summarized in table 5.

TABLE 5.—*Condition of tonsils in childhood and results of Selective Service physical examination approximately 15 years later*

Condition of tonsils	Selectees assigned to Class			
	I-A		I-B or IV-F	
	Number	Percent	Number	Precent
Total	147	100.0	159	100.0
Present	114	77.6	133	83.6
Not enlarged	2	1.4	5	3.1
Enlarged	15	10.2	18	11.3
Diseased	97	66.0	110	69.2
Removed	33	22.4	26	16.4
Totally	29	19.7	23	14.5
Partially	4	2.7	3	1.9

The data of table 5 reveal that:

1. When in school, about two-thirds of the selectees were found to have diseased tonsils, and an additional sixth had already had the tonsils removed.
2. With respect to the status of the tonsils at school examination, no significant difference can be observed between selectees accepted and those rejected for military service.

It seems, therefore, that in this sample the condition of the tonsils during childhood was not related to the development of the physical defects regarded by Selective Service standards as rendering the individual unfit for full military duty. In contrast, an inferior state of nutrition, poor posture, and the relative retardation of growth (as measured by weight) all seem in the child to be associated with the later manifestation of physical abnormalities within the definition of the Selective Service standards. Although it is not possible here to investigate what adult defects may be associated particularly with the childhood status of each of the traits discussed, the present findings suggest rather strongly that these traits are indicative of a significant physical inferiority in children.

DISCUSSION

These findings indicate that a relatively large number of the selectees who have been rejected because of defective dentition and vision already gave evidence of the same defects 15 years ago when they were in elementary school. It is probable also that some of the selectees rejected for cardiovascular diseases and for ear defects could have been identified when in school. The data relative to the last-named conditions are not conclusive, but knowledge regarding their etiology and development support such a view. For most of the remaining physical causes of rejection one might suspect that some sign was also present in childhood. There is, however, no way of determining the validity of such an assumption, because the school examinations

were not directed toward the discovery of the corresponding defects in childhood. The results of the present study suggest also that growth as measured by weight, posture, and the physician's estimate of the state of nutrition—all traits that are frequently examined to determine the health status of the child—are useful as crude predictive indexes of adult physical development. On the other hand, the condition of the tonsils in childhood does not appear to have much significance in relation to the future physical status of the young adult.

The above data and findings, although based on a relatively small sample, enable us to visualize more clearly some of the fundamental aspects of the much-discussed topic of the physical fitness of selectees. Surgeon General Parran has recently said "* * * if it is stupid to waste money and material * * * it is treasonable to waste manpower."[4] It becomes, therefore, of a great deal more than academic interest to know that we have and have had for years a more or less effective way of predicting long in advance the physical status of adults of the now particularly important early productive ages.

It is particularly disturbing to find that, in spite of knowing, for instance, which children in a community would grow up into physically handicapped adulthood, the health professions, the lay professions, and especially society as a whole, has to date apparently failed to take full advantage of the knowledge.

In the not very remote past, public health and medical care programs have, it seems, been dominated by the concept of mortality, a concept not enlightening with reference to child health since mortality is lowest in childhood. The findings of this study seem instead to reinforce the views held by many that disease in adulthood is often brought about by the cumulative effects over a long period of time of many pathologic conditions, many incidents, some of which take place and are even perceived in early infancy. Consequently, the more information that is available, in concrete and well-defined terms, of the individual's past and present health, the more surely can his future physical status be estimated.

It appears rather obvious, on consideration of the findings presented here, that it is imperative for our national concern to guard to the utmost the health of children. On paper and in theory this is a view which all have accepted for some time. Actually, in many respects, lack of forethought, lack of planning, or even mistaken notions of execution of plans have apparently prevented the full realization of such a concept. Now it becomes even more essential to pass from theory to practice, to arrive at a definite formulation of what

[4] Parran, T.: Address delivered at the meeting of the American Academy of Pediatrics, Boston, Mass., Oct. 9, 1941

school medical examinations should consist of, what their objectives ought to be, and, more important, to what end the findings are to be used. School medical examinations have in general been characterized by cursoriness and superficiality, even though in all fairness it must be recognized that they have produced a usable fund of information. However, as was shown above, the results are quite limited in scope and often less than precise.

If it be true, as few will deny, that the need for competent, healthy, physically fit young men is now and will be, for some years, at an all-time high, then this need must be explicitly recognized and satisfied. Satisfaction of this need involves acquiring information on all significant early (and especially remediable) defects, employing accurate measures of functional status, recording the pertinent information in objective and permanent form so as to serve as both a medical history and a basis for the evaluation of therapeutics, and finally, it involves the necessary corrective work. In these ways it would seem possible to attain not only effective prevention of damage from disease but also effective upbuilding of national physical status.

INDUSTRIAL INJURIES AMONG THE URBAN POPULATION AS RECORDED IN THE NATIONAL HEALTH SURVEY [1]

By Joan Klebba, *Junior Statistician, United States Public Health Service*

The purpose of the present report is to summarize data collected in the National Health Survey (1935–36) [2] on accidental industrial injuries that had occurred among workers during the 12 months immediately preceding the enumerator's visit to the household. It does not include information on the causes and types of the accidents themselves, but is limited to consideration of certain social and economic aspects of the resulting injuries. Information of the latter nature is, of course, as important from the point of view of coping with the consequences of industrial accidents as that of the former is from the point of view of their prevention. Facts concerning frequency of injuries among workers in different income groups, variation in compensation hazard with age of worker, and prevalence of

[1] From the Environmental Sanitation Section of the Division of Public Health Methods, National Institute of Health. Acknowledgment is made to Rollo H. Britten, Senior Statistician, and James S. Fitzgerald for direction in the preparation of this report, and to Margaret T. Comstock for much of the statistical tabulation. Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Projects Nos. 712159-658/9999 and 765-23-3-10.

[2] The National Health Survey was a house-to-house canvass of 703,092 urban families in 18 States and 36,801 families in certain rural areas, made to determine the frequency of serious disabling illness, medical care received therefor, and their relation to social and economic conditions. The survey was patterned on previous ones conducted by the United States Public Health Service and in general followed the established techniques developed in such surveys, information being obtained by trained enumerators from the housewife or other responsible member of the household. See Perrott, George St. J., Tibbitts, Clark, and Britten, Rollo H.: The National Health Survey: Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting. Pub. Health Rep., 54: 1663 (1939). Reprint 2098.

orthopedic impairments resulting from industrial injuries at given age levels are some of the data needed to implement any broad program for dealing with the existing problem.

SCOPE, DEFINITION, AND METHOD USED IN PRESENT STUDY

Scope of present study.—The present report summarizes material collected in over 700,000 urban households in the United States on nonfatal [3] industrial injuries occurring among 784,717 white and colored employed workers [4] 16 years of age and over,[5] and presents (*a*) frequency of industrial injuries disabling for 7 calendar days or more among nonmanual and manual workers,[6] by age, sex, and economic status; (*b*) days of disability per case and annual days of disability per person observed, by age; and (*c*) prevalence of orthopedic impairments due to industrial injuries, by age.[7]

Definition of industrial injury.—Only those nonfatal accidental injuries which, as described by the person interviewed, fulfilled the following requirements are included in the present report:

1. The injury must have been sustained by a worker while on duty.[8]
2. The injury must have caused disability (that is, inability to work) for at least 7 calendar days.

---

[3] This report does not present the information obtained on fatal cases because of its recognized incompleteness. It has been known since the United States Census of 1850 that mortality data gathered (during a single visit) in a house-to-house canvass are particularly subject to underenumeration. Disappearance of single-person households, breaking up of other households, and lack of coverage of institutions are some of the factors which result in abnormally low death rates from industrial injuries obtained in a house-to-house canvass.

[4] The term "employed workers," as used in this report, applies to persons (including those on work relief) engaged for wages in money or in kind. Those on vacation, on strike, or temporarily ill who were expecting to return to work, and part-time workers (except those who were attending school regularly) are also included.

[5] The National Health Survey covered 2,498,180 white and colored persons of known age, or 3.6 percent of the urban population of the United States (1930). The sample was chosen to be representative in general of cities in the United States according to region and size. In large cities (100,000 and over) the population to be canvassed was determined by a random selection of many small districts based on those used in the United States Census of 1930. In the smaller cities selected for study the population was enumerated completely. See article by Perrott, Tibbitts, and Britten cited in footnote 2 for a more detailed account of the sampling procedure and a comparison of certain characteristics of the population enumerated with those of the urban population as a whole (Census, 1930).

[6] The category "nonmanual workers" as used in this study is composed of professional persons, wholesale and retail dealers, proprietors, managers (except farmers), and officials, clerks, salesmen, and kindred workers; and "manual workers," of foremen, skilled, semiskilled, and unskilled workers (except farm laborers and servants).

The worker's occupation which was recorded in the National Health Survey was his usual one; persons who never had a job (including work relief jobs) were recorded as having "no occupation" and are not included in the present study. Also not included are those workers classified as servants, farmers, and farm laborers.

[7] For a summary of data obtained on illnesses and accidents, see Britten, Rollo H., Collins, Selwyn D., and Fitzgerald, James S.: The National Health Survey: Some general findings as to disease, accidents, and impairments in urban areas. Pub. Health Rep., 55:444 (1940). Reprint 2143.

[8] Instruction was given to the enumerator to include as industrial injuries both those growing out of the nature of the work itself (e. g., injury to hand resulting from catching it between the gears while operating a lathe) and those which did not (e. g., fracture resulting from fall on stairs in plant on way to or from machine room) with the following exceptions: (1) Injuries sustained while on duty by persons operating, riding in, or struck by a land, air, or water vehicle outside a railroad shop or yards or other industrial workplace not open to the public; and (2) injuries sustained while on duty by domestic servants. The former group has been classified in the National Health Survey as injuries resulting from public accidents, and the latter as injuries resulting from home accidents.

3. The injury must have been sustained during the 12 months immediately preceding the day of the visit.

Method of arriving at annual number of industrial injuries.—In order to obtain for the 12 months prior to the day of the visit the number of industrial injuries by duration of resulting disability it was necessary to add (*a*) the number of cases from which persons had recovered prior to the day of the visit to (*b*) the number of cases from which persons had not recovered prior to the day of the visit for which the estimated completed duration of disability was 7 calendar days or more.[9]

If the cases from which persons had not recovered prior to the day of the visit had been consistently reported in terms of the actual number of days of attained duration instead of largely in terms of the approximate number of weeks or months, a distribution of these cases by estimated completed duration could have been obtained by the following three steps:

1. Arranging a frequency distribution of cases from which persons had not recovered prior to the day of the visit in ascending order of magnitude of attained duration.
2. Finding the first differences of this frequency distribution.
3. Multiplying each member of the resultant distribution of first differences by the number of days in the period of duration of disability of the group of cases comprising that particular first difference.[10]

Because of the concentration, however, in the recorded distribution

[9] The National Health Survey recorded (in addition to injuries with periods of disability of 7 calendar days or more with both onset and recovery within the 12 months prior to the day of the visit): (1) Injuries causing disability on the day of the interview with onset within the study year whether or not the period of disability had attained a duration of 7 calendar days or more; (2) injuries not causing disability on the day of the interview which had onset prior to the study year and 7 calendar days or more duration within the study year; and (3) injuries causing disability on the day of the interview with onset prior to the study year. (Group 3 has been tabulated in the National Health Survey as permanent orthopedic impairments.)

[10] The assumption underlying the above method of determining the distribution of cases from which persons had not recovered prior to the day of the visit by estimated completed duration is that both the total number and the distribution by completed duration of cases beginning on the day of the visit is the same as the total number and the distribution by completed duration of cases beginning on any other day. (It should be pointed out that the effect of the variation in frequency which may have obtained from day to day during the 12 months prior to the day of the visit has been, for all practical purposes, eliminated by reason of the fact that enumeration lasted over a considerable period of time, about 6 months, on every working day of which a number of visits was made. The number of cases from which persons had not recovered prior to the day of the visit with any given attained duration on the day of the visit is in reality, therefore, a summation of such cases enumerated within the 6-month period.)

To elaborate, first let us consider only the group of cases beginning on the day of the visit, and ask how many of these were cases from which persons recovered on the following day.

The answer is found (on the basis of the assumption given above) by subtracting the number of cases which began the day before the visit but from which persons had not recovered on the day of the visit, i. e., the cases with 2 days' attained duration, from the number of cases beginning on the day of the visit Similarly, the question as to how many of the cases beginning on the day of the visit from which persons had recovered on the second day following the visit is answered by subtracting the number of cases which began the second day before the visit but from which persons had not recovered on the day of the visit, i. e., the cases with 3 days' attained duration, from the number of cases beginning on the day of the visit but from which persons had not recovered the day following the visit. And in like manner the number of cases beginning on the day of the visit from which persons recovered 3, 4, 5, and more days after the visit may be determined.

The computation of these figures results in a frequency distribution by estimated completed duration of

of cases by duration in days at the points equal to 1, 2, 3, and more weeks or 1, 2, 3, and more months, it was necessary to introduce certain additional steps to obtain an estimate of the actual number of days in those durations which were recorded only in terms of the nearest whole number of weeks or months.[11]

cases beginning on any day during the 12-month period prior to the day of the visit as well as of those beginning on the day of the visit.

The next step is to determine the frequency distribution by estimated completed duration of all cases with onset within the 12-month period preceding the day of the visit and from which persons had not recovered prior to the visit.

Such distribution is obtained by multiplying the number of those cases beginning on the day of the visit in each of the groups having a particular estimated completed duration by the number of days in that duration. The correctness of this step is obvious on recognition of the fact that the annual number of cases of any given estimated completed duration is equal to the product of (a) the number of such cases beginning on the day of the visit and (b) the number of days before the visit on which cases of the specified duration may have begun in order to be included in the recorded number of cases from which persons had not recovered on the day of the visit.

[11] It was determined empirically that the relationship between frequency and attained duration of cases beginning within the study year and from which persons had not recovered prior to the day of the visit is linear when plotted on double logarithmic paper and may be described by the equation $Y_t=aX_t^b$ (b less than 0); where Y is frequency; X, duration, a, total number of cases from which persons had not recovered prior to the day of the visit; and where b determines the rate of change in frequency with unit change in duration.

Thirty values, ranging from −0.1 to −3.0, were in turn assigned to the parameter b. For each of these values of b all values of X (from 1 to 365) were substituted in the equation $Y_t=aX_t^b$ and the corresponding values of Y in units of a were determined, the values of Y thus obtained forming a frequency distribution by actual attained duration in units of a of all cases from which persons had not recovered prior to the day of the visit.

The first differences of this distribution were taken, resulting in a frequency distribution by estimated completed duration of all cases beginning on any given day.

The number of cases in each of the groups having a particular estimated completed duration in this frequency distribution of first differences was then multiplied by the number of days in that duration to obtain the desired frequency distribution of all cases with onset within the 12-month period preceding the day of the visit and from which persons had not recovered prior to the visit.

The following set of ratios was then computed for each value of b:

1. $\frac{S_{1-17}}{S_{1-365}}$, i. e., the ratio of (a) the sum of the frequencies by actual attained duration of all cases from which persons had not recovered prior to the day of the visit for values of X (duration) from 1 to 17 to (b) the sum of the frequency distribution by actual attained duration of all cases from which persons had not recovered prior to the day of the visit. (It might be pointed out that in the ratio $\frac{S_{1-17}}{S_{1-365}}$ the sum S_{1-17} was selected to be the numerator rather than any other value merely because the stability of $\frac{S_{1-17}}{S_{1-365}}$ was in general greater than that of any other ratio, since S_{1-17} was usually equal to approximately one-half of S_{1-365}.)

2. $\frac{R_{k-m}}{S_{1-365}}$, i. e., ratios of (a) the number of cases (with onset within the 12-month period preceding the day of the visit and from which persons had not recovered prior to the visit) with estimated completed duration in the range $k-m$ (where k is the number of days duration in the lower limit of the class interval for which the particular ratio is being computed and m, the number in the upper limit) to (b) the sum of the frequency distribution by actual attained duration of all cases from which persons had not recovered prior to the day of the visit. (In order to use the National Health Survey data as tabulated, it was necessary to compute 11 such ratios for each of the 30 values assigned to the parameter b, since 11 class intervals were employed in the tabulation of frequency by duration. Following are the class intervals used: 1–6 days, 7–10 days, 11–17 days, 18–24 days, 25–44 days, 45–74 days, 75–99 days, 100–134 days, 135–224 days, 225–344 days, 345–365 days.)

A smooth curve for each class interval was then drawn, by using the ratios $\frac{R_{k-m}}{S_{1-365}}$ ($k-m$ being the particular class interval for which the curve is being drawn) and $\frac{S_{1-17}}{S_{1-365}}$ as paired values of X and Y. There

The procedure used to obtain the annual number of cases disabling for 7 calendar days or more made it possible to establish two types of frequency rates: (1) The annual frequency of industrial injuries disabling for at least 7 calendar days but less than 12 months, and (2) the annual frequency of injuries from which persons had not recovered (i. e., were still unable to work) at the end of a 12-month period following the occurrence of the accident. Also, it made possible the establishment of (1) the annual days of disability per employee and (2) days of disability per case for industrial injuries disabling for at least 7 calendar days but less than 12 months.

It should be noted that since in the present study 84 percent of the injuries disabling for 7 calendar days or more were cases from which persons had recovered before the day of the visit, the annual frequency rate of industrial injuries disabling for at least 7 calendar days but less than 12 months was largely independent of estimates of completed duration of cases from which persons had not recovered prior to the day of the visit. The rate for cases disabling for 12 months or longer, however, was obviously based on estimates of completed duration.

Included with the cases disabling for 12 months are a few for which the estimated completed duration was more than 11 months but less than a full 12 months (345–365 days).

ANNUAL FREQUENCY AND SEVERITY OF NONFATAL INDUSTRIAL INJURIES BY SEX AND AGE

Frequency and amount[12] *of disability.*—The annual frequency of industrial injuries (sole, primary, and contributory causes[13]) disabling

were 30 such paired values available to determine each class interval curve, since frequency distributions in units of a corresponding to the 30 values assigned to b had been computed.

Then in order to obtain a frequency distribution by estimated completed duration from any given frequency distribution (e. g., for a particular age group) by actual attained duration of cases from which persons had not recovered prior to the day of the visit, the ratio $\frac{S_{1-17}}{S_{1-365}}$ was computed and used as abscissa and the corresponding ordinates were read on the interval curves to obtain the 11 factors by which the sum of the frequency distribution was to be multiplied to give the number of cases by estimated completed duration falling within each of the 11 class intervals.

[12] Based on periods of disability of 7 calendar days or more resulting from nonfatal industrial injuries sustained by workers 16 to 65 years of age. Rates for workers 65 years and over are not included because of the small number of cases

[13] For a discussion of classification of disability according to sole, primary, and contributory causes see Britten, Collins, and Fitzgerald, op. cit., footnote 11, p. 448, and lines 21–26, p. 463.

In 78 percent of the reported periods of disability of 7 calendar days or more in which an industrial injury was involved, the sole cause (or diagnosis) was the injury, in 18 percent the injury was the primary cause, and in only 4 percent, a contributory cause

A small number of injuries (258 out of a total of 9,463 industrial injuries among persons of all ages) contributory to other injuries have been included for convenience in tabulating.

for at least 7 calendar days but less than 12 months was 9.6 per 1,000 employees.[14]

The estimated annual frequency of industrial injuries from which the worker had not recovered at the end of 12 months was 1 per 1,000 employees.

The average annual number of calendar days of disability from industrial injuries disabling for at least 7 calendar days but less than 12 months was approximately one-half day per employee.

The average duration of periods of disability from such injuries was 51 days.

TABLE 1.—*Annual frequency of industrial injuries disabling for at least 7 calendar days but less than 12 months among male (nonmanual and manual) and female*[1] *workers 16 years and over, by age* [a]

Age (years)	Annual frequency per 1,000 employees					Ratio of the rate for each age group to that for all ages (all ages=100)					Number of cases, all workers
	Both sexes, all workers	Male workers			Female, all workers	Both sexes, all workers	Male workers			Female, all workers	
		Total	Nonmanual	Manual			Total	Nonmanual	Manual		
All ages, 16 and over	9 6	11.9	5.1	17.1	2.1	100	100	100	100	100	7,560
16-24	7.7	11.6	6 4	15.3	1.9	80	97	125	89	90	1,023
25-34	8.8	11.2	4.8	16.2	2.0	92	94	94	95	95	1,942
35-44	10 1	11.9	4.6	17.4	2.1	105	100	90	102	100	1,980
45-54	10.7	12.1	5.3	17.0	2.4	112	102	104	99	114	1,518
55-64	11.7	13.0	5.0	19.3	2.6	122	109	98	113	124	801
65 and over	12.3	13.7	4.9	22.0	(2)	128	115	96	129	(2)	296

1 Rates not shown separately for nonmanual and manual female workers because of small number of cases.
2 5 cases only.

14 Since the informant was asked at a single visit to recall accidents which had occurred among workers in the family during the previous 12 months, this rate is somewhat below the true value, even though a minimum period of disability (7 calendar days) was set in order to avoid too great underreporting.

The number of persons employed on the day of the visit is used as the number of employee-years worked during the 12 months prior to the day of the visit by the number of persons enumerated in the National Health Survey. Since the enumeration lasted over a considerable period of time (about 6 months) on every working day of which a number of visits was made, it is reasonable to suppose that the total of the number of persons found employed on each day during the survey does not differ substantially from the total number of days worked by the entire surveyed population during the 12 months prior to the day of the visit divided by the average number of working days in a year.

The number of employee-hours is not available for the persons enumerated in the National Health Survey. But the comparisons of relative changes by age and income (on which the findings of this report are primarily based) are independent of whether the base is measured in employee-hours or employee-years, since it is reasonable to assume that no individual age or income group was affected disproportionately by variation in the number of hours in the average working year to an extent sufficient to vitiate the comparisons. (In fact it is believed that the elimination of any bias introduced by using employee-years instead of employee-hours would make the present findings of increase with age and decrease with income in the rate for industrial injuries even more pronounced. See footnotes 18 and 27.) The selection of employee-years was made in view of the fact that the recorded frequency of cases of industrial injuries was for the 12 months immediately preceding the day of the visit.

Frequency and amount of disability [15] *by sex.*—The annual frequency of industrial injuries disabling for at least 7 calendar days but less than 12 months was almost 6 times as high for male workers as for female workers. As shown in table 1, the rate for male workers was 11.9 per 1,000 employees and that for female workers, 2.1.

TABLE 2.—*Estimated annual frequency of industrial injuries from which the worker had not recovered at the end of 12 months among male (nonmanual and manual) and female workers*[1] *16 years and over, by age* [a]

Age (years)	Annual frequency per 1,000 employees					Number of cases, all workers
	Both sexes, all workers	Male workers			Female, all workers	
		Total	Nonmanual	Manual		
All ages, 16 and over	1.0	1.2	0.33	1.9	0.27	797
16-24	.53	.81		1.1		71
25-34	.59	.73		1.1		130
35-44	1.0	1.2		1.9		203
45-54	1.4	1.5		2.4		195
55-64	2.0	2.2		3.4		136
65 and over	2.6	2.8		4.8		62

[1] Rates not shown by age for female workers and male nonmanual workers or separately for nonmanual and manual female workers because of small number of cases.

The estimated annual frequency rate of industrial injuries from which the worker had not recovered at the end of 12 months was almost 5 times as high for male workers as for female workers. As shown in table 2, the rate for male workers was 1.2 per 1,000 employees and that for female workers, 0.27.

This excess in the rate for males may not to any great extent be attributed to a sex differential in accident proneness.[16] Undoubtedly it is due in part to the more hazardous activities of the male workers. Because of the probability of slightly more complete reporting by an informant of his or her own illness, the excess in the rate for males may be somewhat of an understatement, since in a greater percentage of instances females were the informants.

The average annual number of calendar days of disability from industrial injuries disabling for at least 7 calendar days but less than 12 months was 6 times as high for males (0.60 day per employee) as for females (0.10 day per employee).

The average duration of periods of disability from such injuries, however, was almost the same for male as for female workers (51 and 50 days).

[15] See footnote 12.

[16] See Britten, Rollo H., Klebba, Joan, and Hailman, David E.: Accidents in the urban home as recorded in the National Health Survey. Pub. Health Rep., 55: 2061 (1940). In this report it is shown that the National Health Survey rate for home accidents is almost 1½ times as high for females as for males.

Frequency and amount[17] *of disability by age.*[18]—The annual frequency of industrial injuries disabling for at least 7 calendar days but less than 12 months increased with age from 7.7 per 1,000 employees for persons 16–24 years to 12.3 for persons 65 years and over, but the rate of increase from one age group to the next is higher for younger persons than for older persons (table 1).

In the case of industrial injuries from which the worker had not recovered at the end of 12 months (table 2), the estimated annual

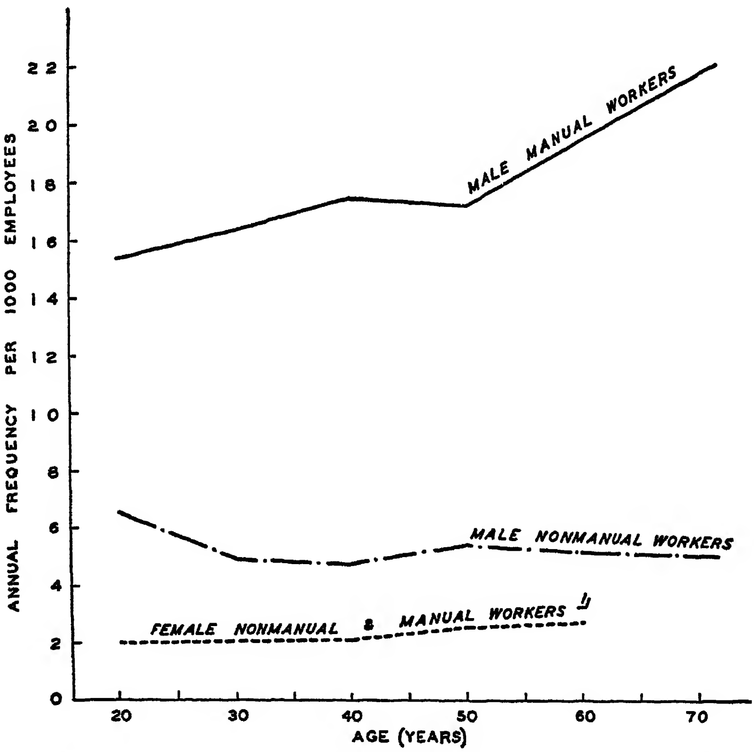


FIGURE 1.—Annual frequency of industrial injuries resulting in disability for at least 7 calendar days but less than 12 months among male (nonmanual and manual) and female workers 16 years and over, by age.
[1] Rates not shown separately for nonmanual and manual female workers or for female workers 65 years and over because of small number of cases.

frequency rate rose even more steeply with age, from 0.53 per 1,000 employees for persons 16–24 years to 2.6 for persons 65 years and

[17] See footnote 12.

[18] Because of the use of employee-years rather than employee-hours as the unit in which the base is measured, it is possible that the increase with age in frequency (both of industrial injuries disabling for at least 7 calendar days but less than 12 months and of those from which persons had not recovered at the end of a 12-month period following the occurrence of the accident) is somewhat understated, since younger persons may work more hours in a year than older persons.

Also, it is felt that the influence of age is understated because a greater proportion of older workers than of younger workers perform less hazardous work, e. g., more older workers are night watchmen while more younger ones are linemen.

over. In the case of these more severe industrial injuries the greatest proportional increase in the rate occurred among persons about 30 to 40 years of age; the estimated annual frequency was 0.59 for persons 25–34 years and 1.0 for persons 35–44 years.

The average annual number of calendar days of disability from industrial injuries disabling for at least 7 calendar days but less than 12 months increased with advancing age from 0.34 days per employee 16–24 years of age to 0.69 days per employee 55–64 years (table 3).

The average duration of periods of disability from such injuries also increased with advancing age, from 44 days for persons 16–24 years to 59 days for persons 55–64 years.

RELATION OF SOCIO-ECONOMIC STATUS AND ANNUAL FREQUENCY AND SEVERITY OF INDUSTRIAL INJURIES, BY AGE AND SEX

Frequency among male nonmanual and manual workers and among female workers[19] *by age.*—As is shown in table 1, the annual frequency rate of industrial injuries disabling for at least 7 calendar days but less than 12 months is approximately 8 times as high at each age for male manual workers as for female nonmanual and manual workers combined. As is also shown in table 1, the rate for male manual workers and for all female workers rises steadily with age: The rate rises from 15.3 for male manual workers 16–24 years to 22.0 for male manual workers 65 years and over, and from 1.9 for all female workers 16–24 years to 2.6 for all female workers 55–64 years of age.[20] In the case of male nonmanual workers, however, the trend with age is different: The highest rate (6.4) is for workers 16–24 years of age; after age 25 not only is there little variation with age, but after age 55 the variation that does exist is downward with advancing age. Comparisons of these rates (by age) for male nonmanual, male manual, and female workers may be made from figure 1.

As shown in table 2, for industrial injuries from which the worker had not recovered at the end of 12 months the estimated annual frequency rate for male manual workers (1.9 per 1,000 employees) is almost 6 times as high as that for nonmanual workers (0.33) and 7 times as high as that for female workers (0.27). The rate for male manual workers increases with advancing age from 1.1 for persons 16–24 years to 4.8 for persons 65 years and over.[21]

The frequency of nonfatal industrial injuries (resulting in either temporary or permanent disability) in 30 manufacturing industries was found by the Bureau of Labor Statistics to be 17.82 per million

[19] Rates are not shown separately for female nonmanual and manual workers because of the small number of cases.

[20] Rates are not shown for all female workers 65 years and over because of the small number of cases.

[21] Rates are not shown by age for female workers and male nonmanual workers or separately for nonmanual and manual female workers because of small number of cases.

employee-hours worked for the year 1935.[22] This rate is at least roughly comparable to the estimated National Health Survey rate for nonfatal industrial injuries of all durations (1–365 days or more) occurring during the 12 months prior to the day of the visit among male manual workers (34.5 per 1,000 employees [23]). The two rates would be found to be approximately equal if 2,000 hours (fifty 40-hour weeks) were to be taken as the annual average number worked per person by the employed population in the National Health Survey.

The finding of the present report concerning the relationship of age and frequency of industrial injuries, however, does not appear to substantiate that of certain other available inquiries. Previous studies indicate a decrease in frequency of industrial injuries with advancing age.[24]

In any attempt to determine the cause of the reversal in the trend with age found in this report from that stated in former studies it should be noted that the present survey differs from all of the other surveys in both scope and source of information. In the National Health Survey information was obtained from the worker or a member of his household, interviewed at his residence, and not from a State agency, insurance company, place of occupation, or sick benefit association; and enumeration was extended to noncompensated as well as compensated cases of industrial injuries, including those occurring in small establishments with insufficient number of employees to be covered by the usual type of compulsory reporting. Also, the occupations sampled in the National Health Survey were representative not only of selected industries but of the total urban labor market (except servants in private homes, persons in occupations involving motor vehicles operating in public places, and agricultural workers domiciled in a city).

Amount of disability among male nonmanual and manual workers and among female workers [25] *by age* [26].—As is shown in table 3, at each age the average annual number of calendar days of disability from industrial injuries disabling for at least 7 calendar days but less than 12 months is much higher for male manual workers than for male nonmanual or for female workers. For male manual workers the rate

[22] Fleming, Roy F., and Lotven, Jacob: Injury experience in 30 manufacturing industries, 1935 and 1936. Monthly Labor Review, 48:676 (1938), table 2.

[23] Unpublished data from the survey made by the Committee on the Costs of Medical Care show that over 45 percent of the total annual number of disabling cases from all causes (illnesses and accidents) are cases disabling less than 7 days. Based on this figure it is estimated that the annual frequency of nonfatal industrial injuries of all durations occurring among male manual workers in the National Health Survey population would be 34.5 per 1,000 employees (i. e., (*a*) 17.1 for cases disabling for at least 7 days but less than 12 months, plus (*b*) 1.9 for cases from which persons had not recovered at the end of 12 months, and finally plus (*c*) 15.5 for cases disabling 1–6 days).

[24] For a summary of the principal findings of the available surveys in regard to the relation of age to industrial injuries see Kossoris, Max D.: Relation of age to industrial injuries. Monthly Labor Review, 51:789 (1940).

[25] See footnote 19.

[26] See footnote 12.

rises from 0.67 days per employee 16–24 years to 1.1 days per employee 55–64 years. In the case of female workers there is also an increase with advancing age, the rate being 0.08 days per employee 16–24 years and 0.16 days per employee 55–64 years. For the male nonmanual worker, however, the rate follows a different pattern with advancing age: From 0.30 days per employee 16–24 years it decreases to 0.19 days per employee 25–34 years, then rises with age to 0.34 days per employee 55–64 years.

TABLE 3.—*Average annual days of disability per employee and days per case for industrial injuries disabling for at least 7 calendar days but less than 12 months among male (nonmanual and manual) and female workers 16–64 years,*[1] *by age*

Age (years)	Both sexes, all workers	Male workers			Female, all workers	Number of cases, all workers
		Total	Nonmanual	Manual		
	Annual days of disability per employee					
All ages, 16–64	0.49	0.60	0 25	0.87	0.10	7,264
16–24	.34	.52	.30	.67	.08	1,024
25–34	.39	.50	.19	.75	.09	1,941
35–44	.54	.63	.23	.93	.13	1,980
45–54	.60	.68	.28	.96	.15	1,518
55–64	.69	.77	.34	1.10	.16	801
	Days of disability per case					
All ages, 16–64	50 9	50 9	48.4	51.5	50.3	7,264
16–24	44 2	44 4	45.9	43.9	42 2	1,024
25–34	44.8	44.9	38.6	46.3	44.5	1,941
35–44	53 3	52 9	49.4	53 7	61.9	1,980
45–54	55 9	55 7	52.1	56.6	59.5	1,518
55–64	58.8	58.8	67.7	56.9	61.0	801

[1] Rates not shown separately for female nonmanual and manual workers or for workers 65 years and over because of the small number of cases.

The variation with age in the average duration of periods of disability is much greater for female workers than for male workers (table 3). For the former the rate rises from 42 days for persons 16–24 years to 61 days for persons 55–64 years. For male manual workers the rate increases from 44 days for persons 16–24 years to 57 days for persons 55–64 years. The rate for male nonmanual workers is 46 days for persons 16–24 years, decreases to 39 days for workers 25–34 years and then increases with advancing age to 68 days for persons 55–64 years.

As is evident in figure 2, the fluctuation with age in the average annual number of calendar days of disability per employee in the case of male nonmanual workers is due not only to the fluctuation with age in the frequency rate but also to the fluctuation with age in the average duration of period of disability.

In the case of male manual workers, although all three curves rise with age, it is evident that after age 45 the increase in the average number of calendar days of disability per employee reflects predomi-

nantly the increase in frequency since there is little change in the average duration of period of disability after this age.

In the case of female workers the average days of disability per

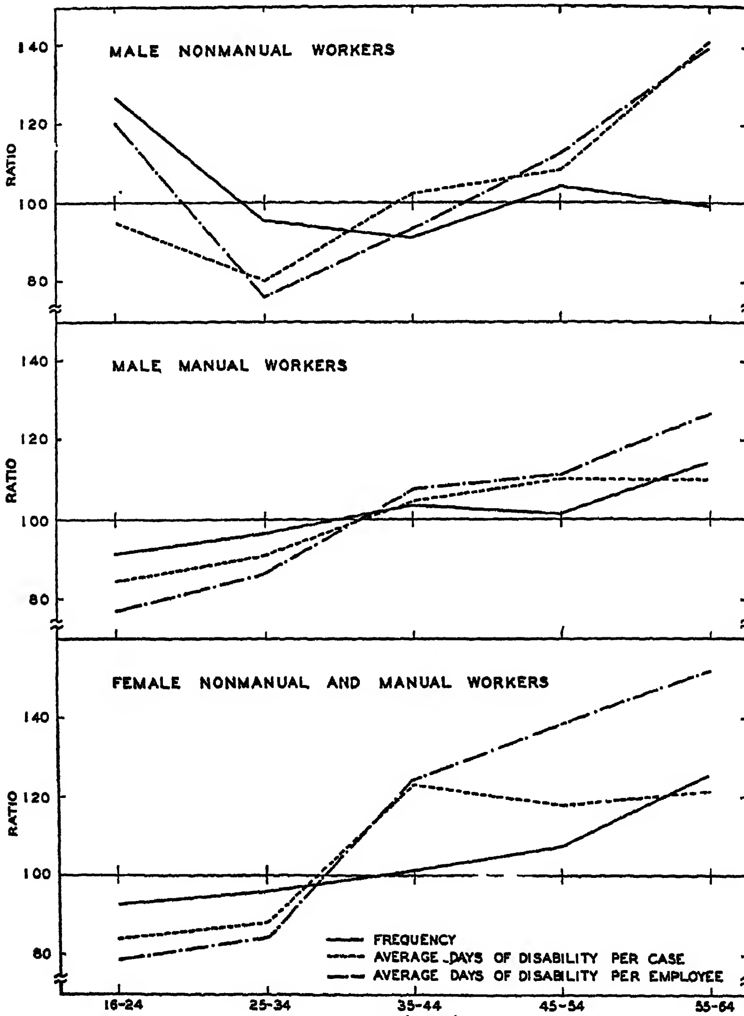


FIGURE 2.—Ratio of the rate for each age to that for all ages (16-64 years) for (1) frequency, (2) average day of disability per employee, and (3) average days of disability per case for industrial injuries resulting in disability for at least 7 calendar days but less than 12 months among male (nonmanual and manual) and female workers 16-64 years, by age. (Ratios not shown separately for female nonmanual and manual workers or for workers 65 years and over because of the small number of cases.) (Rate for all ages = 100)

employee rises with age, but after about age 45 the increase with advancing age reflects solely the increase in frequency, since after this age the average duration of period of disability decreased.

Frequency and economic status.—Workers in poor economic status [27] reported relatively more industrial injuries disabling for at least 7 calendar days but less than 12 months than did workers in those families in the higher income brackets (table 4). The annual frequency rate decreases progressively from 16.5 per 1,000 employees for workers observed in the relief group to 4.8 for workers in families with annual family income [28] of $2,000 and over.

TABLE 4.—*Annual frequency of industrial injuries disabling for at least 7 calendar days but less than 12 months among male (nonmanual and manual) and female [1] workers 16 years of age and over, by economic status* [b]

Annual family income and relief status	Annual frequency per 1,000 employees					Ratio of the rate for each income group to that for the highest income group ($2,000 and over=100)					Number of cases, all ages, 16 years and over
	Both sexes, all workers [2]	Male workers			Female, all workers	Both sexes, all workers	Male workers			Female, all workers	
		Total	Nonmanual	Manual			Total	Nonmanual	Manual		
All incomes	9.6	11.9	5.1	17.1	2.1	200	202	165	140	150	7,560
Relief	16.5	19.0	11.4	20.5	3.9	344	322	368	168	279	1,464
Nonrelief:											
Under $1,000	14.0	17.5	8.3	20.9	3.0	292	297	268	171	214	2,131
$1,000 to $1,500	10.1	12.4	6.0	16.2	2.0	210	210	194	133	143	1,818
$1,500 to $2,000	7.3	9.0	4.8	13.3	1.6	152	153	155	109	114	1,079
$2,000 and over	4.8	5.9	3.1	12.2	1.4	100	100	100	100	100	856

[1] Rates not shown separately for nonmanual and manual female workers because of small number of cases.
[2] Rates adjusted to the age composition of all nonmanual and manual workers 16 years and over (employed on day of visit) enumerated by the National Health Survey were as follows: Relief, 16.5; nonrelief: Under $1,000, 14.0; $1,000 to $1,500, 10.2; $1,500 to $2,000, 7.3; $2,000 and over, 4.7.

This inverse correlation of frequency rate and annual family income shown for the total number of industrial injuries disabling for at least 7 calendar days but less than 12 months also obtains for

[27] In the National Health Survey families were classified by income received during the 12 months preceding the interview and also by whether relief from official agencies had been received during that time. Persons in families with annual income under $1,000 comprised about 40 percent of the surveyed group; about 65 percent were in families with annual incomes under $1,500; and 80 percent in families with incomes under $2,000. Almost one-half of the lowest income group had been in receipt of relief during the year 1935.

[28] Economic status used is based on annual family income and is not necessarily that existing on the day of the injury. Nevertheless the variation in the frequency rate of industrial injuries with annual family income as shown and with income at the time of the accident probably differs little, if at all, except in the case of relief families. In this group, there may be a selection due to the fact that if a family had been on relief at any time during the 12-month period prior to the day of the visit that family was recorded as of relief status no matter what its actual annual income was. For example, at the time of the accident a worker may have been in a family with $1,500 and over annual family income, but because of the accident the family income may have been reduced to relief status during the interim between the date of the occurrence of the accident and that of the visit. In that event the injury would have been recorded as occurring among persons on relief. It is felt, however, that the effect of thus augmenting the rate for the relief group is more than offset by the fact that a greater proportion of the employed persons in the relief group than of those in any other economic status group worked a smaller average number of hours per year, e. g., persons on work relief and part-time workers. It is believed that the net result of these factors is an understatement in the decrease in the rate with rise in annual family income.

male nonmanual workers, male manual workers, and female nonmanual and manual workers. For male manual workers the rate decreases progressively from over 20 for workers in the relief group and the group with income of under $1,000 to 12.2 for workers in families with $2,000 and over annual income; for male nonmanual workers, from 11.4 among workers in the relief group to 3.1 for workers in families with annual income of $2,000 and over; and similarly for female nonmanual and manual workers, from 3.9 to 1.4.

In order to investigate the relation between frequency of injuries disabling for at least 7 calendar days but less than 12 months and economic status with the differential effect of age removed, the rates by economic status (all workers) have been adjusted to a standard age distribution.[29] The adjusted rates (shown in table 4, footnote 2) do not differ substantially from the crude rates.

TABLE 5.—*Estimated annual frequency of industrial injuries from which the worker had not recovered at the end of 12 months among male (nonmanual and manual) and female* [1] *workers 16 years and over, by economic status* [b]

Annual family income and relief status	Annual frequency per 1,000 employees					Number of cases, all ages, 16 years and over
	Both sexes, all workers [2]	Male workers			Female, all workers	
		Total	Nonmanual	Manual		
All incomes	1.0	1.2	0.33	1.9	0.27	797
Relief	2.6	3.0	----------	3.4	----------	229
Nonrelief:						
Under $1,000	1.6	2.0	----------	2.5	----------	238
$1,000 to $1,500	.89	1.1	----------	1.4	----------	160
$1,500 to $2,000	.56	.65	----------	1.1	----------	82
$2,000 and over	.36	.43	----------	1.0	----------	64

[1] Rates not shown by economic status for female workers and male nonmanual workers or separately for nonmanual and manual female workers because of small number of cases.
[2] Rates adjusted to the age composition of all nonmanual and manual workers 16 years and over (employed on day of visit) enumerated by the National Health Survey were as follows: Relief, 2.6; nonrelief: under $1,000, 1.6; $1,000 to $1,500, 0.92; $1,500 to $2,000, 0.57; $2,000 and over, 0.35.

The variation with income is even more marked for industrial injuries from which the worker had not recovered at the end of 12 months than for those disabling for at least 7 calendar days but less than 12 months (table 5). The estimated annual frequency of these more severe injuries decreases progressively from 2.6 per 1,000 employees for workers in the relief group to 0.36 for the group with annual family income of $2,000 and over, a decrease of 86 percent. For male manual workers the rate among the relief group (3.4 per 1,000 employees)

[29] The English method of standardizing rates was used, i. e., the population within each income and age group was multiplied by the annual frequency rate for all income groups in the corresponding age group, the products for each income group were summed, and the resulting sums were each divided by the actual population in the particular income group. The actual rate for all incomes was then expressed as percentages of the expected rates by economic status thus obtained. Each of these percentages was then applied to the actual rates by economic status to obtain the rates for each economic status standardized to the age distribution of the total number of workers (all incomes).

was over 3 times as high as that for workers in families with annual income of $2,000 and over (1.0 per 1,000 employees).[30]

There is no substantial difference in the crude rates for these more severe injuries and the rates adjusted for age composition (shown in table 5, footnote 2). (See footnote 29.)

As is shown in figure 3, the excess in the annual frequency rate for workers in low-income families over that for workers in families with annual income of $2,000 and over is much greater in the case of injuries from which the worker had not recovered at the end of 12 months than for injuries disabling for at least 7 calendar days but less than 12 months.

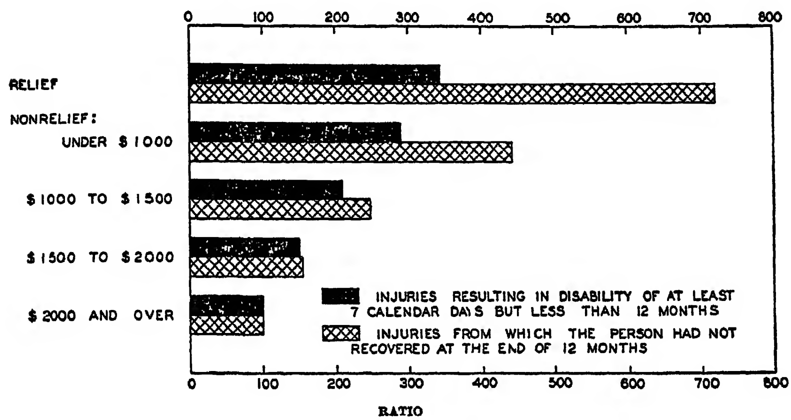


FIGURE 3.—Ratio of annual frequency rate for each income group to that for the highest income group ($2,000 and over = 100) for (1) industrial injuries resulting in disability for at least 7 calendar days but less than 12 months, and (2) industrial injuries from which the person had not recovered at the end of 12 months.

ORTHOPEDIC IMPAIRMENTS RESULTING FROM INDUSTRIAL INJURIES ACCUMULATED OVER THE ATTAINED LIFETIME OF THE SURVEYED POPULATION

Because of the time factor necessary to determine permanency of impairments (except amputations) it was impossible to assess the proportion of the industrial injuries occurring within the 12 months prior to the day of the visit which resulted in permanent orthopedic impairments. It was felt, however, that a prevalence rate of orthopedic impairments (resulting from industrial injuries) accumulated over the attained lifetime of all living individuals in the survey would closely approximate a true measure of the relative seriousness of the situation by age and sex despite this incompleteness for

[30] Rates are not shown by income for female workers and male nonmanual workers because of small number of cases.

current cases.[31] As table 6 shows, the prevalence of such impairments (including both loss of members and crippled or paralyzed members) among all persons (workers and nonworkers) 15 years and over in the surveyed population was 7.6 per 1,000 persons.

TABLE 6.—*Prevalence of orthopedic impairments among all persons (workers and nonworkers) 15 years and over in the surveyed population caused by industrial injuries* [1] *according to sex and age of person observed* [a]

Sex	Prevalence per 1,000 persons by age (years)					Number of cases, all ages, 15 years and over
	All ages, 15 and over	15–24	25–44	45–64	65 and over	
Both sexes	7.59	1.06	6.37	12.90	16.94	14,381
Male	15.28	2.04	12.64	25.29	36.76	13,716
Female	.67	.22	.74	.88	.94	665

[1] Permanent effects of nonfatal industrial injuries accumulated over the attained lifetime of living individuals in the population observed (15 years and over).

Because of the greater proportion of males employed the prevalence of orthopedic impairments due to accidental industrial injuries was much greater among males (15.3 per 1,000 persons) than among females (0.67). For both males and females, however, the prevalence rate increased rapidly with advancing age. For persons 15–24 years the rate (both sexes) was 1.1 per 1,000; it was almost 6 times as high (6.4) in the age group 25–44, over 11 times as high (12.9) in the age group 45–64, and increased to almost 16 times that amount (16.9) among older persons (65 years and over). Undoubtedly this rapid increase in the rate with advancing age is due largely to the accumulation (over the attained lifetime of the population) of the permanent effects of accidental industrial injuries. The high rate among persons of the younger age groups in the present population (6.4 per 1,000 persons 25–44 years) should be noted.

As was shown in a previous report [32] over 70 percent of these orthopedic impairments involved the loss of members. Of the total number of losses 86 percent were fingers and toes and 14 percent were "major" members, i. e., members other than fingers and toes. In the case of crippled or paralyzed members, however, the situation was reversed, the percentage involving major members (77 percent) being much higher than that involving fingers and toes (23 percent).

[31] Impairments enumerated were of such a serious nature that the family informant considered them to be permanently crippling, deforming, or paralyzing (including loss of members). They may or may not have caused disability, i. e., inability to pursue usual activities of work, school, household duties, etc.

Since, in general, only one orthopedic impairment was coded for each individual, all references to total prevalent cases can also be considered as representing the total number of individuals affected. "One orthopedic impairment" may be inclusive of more than one member or part of the body, but when it was not possible to include under "one orthopedic impairment" all parts of the body affected for one person, the most serious impairment was coded.

[32] Britten, Collins, and Fitzgerald, op. cit.

SUMMARY

Aside from establishing for industrial injuries disabling for at least 7 calendar days but less than 12 months (*a*) an annual frequency rate per 1,000 employees (9.6), (*b*) annual number of days of disability per employee (one-half day), and (*c*) average days of disability per case (51 days) and estimating for industrial injuries from which the worker had not recovered at the end of 12 months an annual frequency rate per 1,000 employees (1.0), there are 6 major findings in this report:

(1) The frequency rates of industrial injuries (both in the case of those disabling for at least 7 calendar days but less than 12 months and of those from which the worker had not recovered at the end of 12 months) rise with advancing age.

(2) The average duration of periods of disability resulting from industrial injuries increases directly with the age of the injured worker.

(3) The frequency rate of industrial injuries (both in the case of those disabling for at least 7 calendar days but less than 12 months and of those from which the worker had not recovered at the end of 12 months) is about 5 times as high for male workers as for female workers.

(4) The annual frequency rate of industrial injuries among male manual workers is over 3 times as high as that for nonmanual workers in the case of those injuries disabling for at least 7 calendar days but less than 12 months, and is almost 6 times as high in the case of those from which the worker had not recovered at the end of 12 months. (The variation in exposure or amount of hazard by sex is not elimi ated in this comparison.)

(5) An inverse relationship obtains between the frequency rate of industrial injuries and amount of annual family income.

(6) The prevalence rate of permanent orthopedic impairments resulting from industrial injuries increases with advancing age, but the increase is due largely to the accumulation over the attained lifetime of the population of the permanent effects of accidental industrial injuries. The rate among male workers in the industrially effective age groups, 15–64 years, is markedly high.

CONCLUSIONS

These findings point toward the continuing importance of certain social and economic objectives, such as industrial accident prevention by the use of safety devices, provision for the added compensation hazard of older workers, adequate industrial injury insurance coverage for workers of all ages, and development of programs for vocational rehabilitation at different age levels of workers with permanent orthopedic impairments.

REFERENCES TO TABLES AND CHARTS

(These references are to be considered as supplementary to the basic description of the National Health Survey technique and definitions which have been given in "Scope and method of a Nation-wide canvass of sickness in relation to its social and economic setting," by George St. J. Perrott, Clark Tibbitts, and Rollo H. Britten. Pub. Health Rep., 54: 1663 (1939). Reprint 2098.)

[a] Based on 784,717 nonmanual and manual workers 16 years and over in 83 cities, distributed by age and sex as follows:

	All ages, 16 years and over	16-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 years and over
Nonmanual and manual workers:							
Both sexes	784,717	133,673	221,282	195,856	141,338	68,508	24,060
Male	604,388	78,943	162,690	160,579	121,283	59,668	21,225
Female	180,329	54,730	58,592	35,277	20,055	8,840	2,835
Nonmanual workers:							
Both sexes	378,501	68,427	113,287	91,925	62,569	30,792	11,501
Male	260,822	32,820	71,498	69,179	50,803	26,246	10,276
Female	117,679	35,607	41,789	22,746	11,766	4,546	1,225
Manual workers:							
Both sexes	406,216	65,246	107,995	103,931	78,769	37,716	12,559
Male	343,566	46,123	91,192	91,400	70,480	33,422	10,949
Female	62,650	19,123	16,803	12,531	8,289	4,294	1,610

[b] Rate for all incomes (including unknown) based on 784,717 nonmanual and manual workers 16 years of age and over in 83 cities, distributed by sex and income as follows:

Annual family income, relief status	Both sexes	Male	Female
Total	784,717	604,388	180,329
Relief	88,940	74,122	14,818
Nonrelief:			
Under $1,000	151,894	115,904	35,990
$1,000 to $1,500	179,843	140,827	39,016
$1,500 to $2,000	147,145	113,463	33,682
$2,000 and over	178,937	134,298	44,639
Unknown income	37,958	25,774	12,184

Rates for 37,958 persons of unknown income are not shown.

[c] Based on 1,895,366 persons of known age in 83 cities, distributed by age and sex as follows:

	All ages, 15 years and over	15-24 years	25-44 years	45-64 years	65 years and over
Both sexes	1,895,366	446,369	820,826	485,762	142,409
Male	897,521	206,696	388,002	239,187	63,636
Female	997,845	239,673	432,824	246,575	78,773

DEATHS DURING WEEK ENDED NOVEMBER 29, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 29, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	8,404	8,325
Average for 3 prior years	8,556	
Total deaths, first 48 weeks of year	399,998	400,623
Deaths per 1,000 population, first 48 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	568	555
Average for 3 prior years	537	
Deaths under 1 year of age, first 48 weeks of year	25,386	24,086
Data from industrial insurance companies:		
Policies in force	64,683,252	64,822,543
Number of death claims	12,684	13,091
Death claims per 1,000 policies in force, annual rate	10.2	10.6
Death claims per 1,000 policies, first 48 weeks of year, annual rate	9.8	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 6, 1941

Summary

Favorable health conditions continue to prevail with reference to the important communicable diseases. Of the 9 diseases included in the following weekly table, the incidence of only influenza, meningococcus meningitis, and poliomyelitis is above the 5-year (1936–40) median.

The number of reported cases of influenza increased slightly, from 2,478 to 2,742, and the incidence is above the 5-year median, but there is no indication of a general epidemic. Of the 2,742 cases reported, 2,201 occurred in the West South Central and South Atlantic States, where Texas reported 1,245, South Carolina 409, Virginia 250, Arkansas 117, and Oklahoma 104. Arizona, with 127 cases, was the only other State reporting more than 100 cases for the current week.

The number of cases of poliomyelitis dropped from 112 to 99. New York State with 16 cases, Tennessee with 12, and Alabama with 8, were the only States reporting more than 6 cases.

Of 25 cases of smallpox, Indiana reported 10 cases, Iowa 4, and Missouri 3. Ohio reported 18 cases of typhoid (16 last week) and New York 6 (as compared with 88 last week). Most of the remaining cases were reported in the southern States. Of 93 cases of endemic typhus fever, 44 cases were reported in Georgia, 12 in Texas, 11 in Louisiana, and 9 in Alabama.

The crude death rate for the current week in 87 large cities in the United States is 11.9 per 1,000 population, as compared with 11.8 last week and 12.1 for the 3-year (1938–40) average.

Telegraphic morbidity reports from State health officers for the week ended December 6, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940	
NEW ENG.												
Maine	0	1	2	1	2	1	352	54	40	0	0	0
New Hampshire	0	0	0	------	------	------	8	0	2	0	0	0
Vermont	2	0	0	------	------	------	0	24	23	0	0	0
Massachusetts	2	6	4	------	------	------	141	236	282	5	1	2
Rhode Island	4	1	1	------	------	------	2	0	2	0	0	0
Connecticut	1	1	2	1	2	5	59	4	46	1	0	1
MID. ATL.												
New York [1]	16	15	33	[1] 8	[1] 3	[1] 12	295	733	509	3	3	3
New Jersey	4	10	12	7	6	9	17	231	33	1	0	1
Pennsylvania	7	21	30	------	------	------	495	1,195	76	5	3	3
E. NO. CEN.												
Ohio	19	13	44	14	44	14	36	52	20	0	1	1
Indiana	17	9	20	47	1	12	17	20	14	1	0	0
Illinois	34	21	37	14	10	10	24	653	28	0	1	1
Michigan [3]	3	10	21	------	9	4	39	597	238	1	0	1
Wisconsin	1	0	3	4	69	27	0	242	68	2	0	0
W. NO. CEN.												
Minnesota	5	1	4	1	2	2	33	6	15	0	0	0
Iowa	2	2	3	2	3	3	32	46	16	1	2	0
Missouri	6	9	17	14	1	21	12	7	7	0	0	1
North Dakota	1	4	4	10	10	10	88	2	2	0	0	0
South Dakota	8	1	1	------	------	------	1	0	0	2	0	0
Nebraska	2	1	2	------	------	------	9	3	2	0	0	0
Kansas	5	4	9	8	14	10	110	32	32	0	0	1
SO. ATL.												
Delaware	0	0	1	1	------	------	2	7	3	0	1	0
Maryland [3]	12	1	18	8	6	13	85	4	14	4	1	2
Dist. of Col.	0	4	7	2	------	2	4	0	1	0	0	0
Virginia [2]	40	26	55	250	166	132	202	69	33	0	0	1
West Virginia	12	7	18	6	6	16	230	11	15	2	0	2
North Carolina [2]	70	15	72	6	6	6	267	26	139	0	2	2
South Carolina [2]	19	8	11	409	301	381	29	20	20	0	1	1
Georgia [2]	19	21	21	40	133	99	27	27	8	0	0	0
Florida [2]	4	8	11	10	14	6	2	4	4	0	0	0
E. SO. CEN.												
Kentucky	16	3	20	6	5	15	175	114	7	2	0	0
Tennessee	13	11	22	80	20	53	51	21	21	1	1	1
Alabama [2]	35	17	27	65	42	124	62	12	14	0	0	2
Mississippi [2 3]	18	5	12	------	------	------	------	------	------	1	1	1
W. SO. CEN.												
Arkansas	22	6	15	117	83	83	79	5	5	0	0	0
Louisiana [2]	9	10	13	8	32	12	3	1	1	1	2	1
Oklahoma	17	21	21	104	288	118	0	2	4	1	0	1
Texas [2]	83	55	55	1,245	370	370	250	64	64	1	1	3
MOUNTAIN												
Montana	2	12	2	10	12	6	52	6	11	0	0	0
Idaho	0	1	1	------	17	5	8	0	24	0	0	0
Wyoming	0	1	1	2	8	------	3	1	1	0	0	0
Colorado	13	6	9	49	23	23	41	28	17	0	0	1
New Mexico	3	1	5	------	6	1	12	21	13	0	0	0
Arizona	1	1	6	127	471	92	51	29	3	0	0	0
Utah [3]	0	0	1	10	243	28	29	8	23	0	0	0
Nevada	0	0	------	------	------	------	3	0	------	0	0	------
PACIFIC												
Washington	0	1	2	2	95	------	6	31	31	0	0	1
Oregon	2	1	1	16	368	41	40	15	14	0	2	1
California	20	26	81	93	6,772	52	509	84	84	0	2	2
Total	569	393	740	2,742	9,663	1,984	3,998	4,747	4,063	35	25	34
49 weeks	15,661	14,789	26,043	589,698	191,873	169,793	855,421	257,640	279,485	1,915	1,568	2,700

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 6, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940		Dec. 6, 1941	Dec. 7, 1940	
NEW ENG.												
Maine	6	0	0	18	19	11	0	0	0	2	4	2
New Hampshire	1	0	0	3	3	3	0	0	0	0	0	0
Vermont	0	0	0	7	2	6	0	0	0	0	0	0
Massachusetts	5	0	0	268	140	129	0	0	0	3	1	1
Rhode Island	0	0	0	10	7	11	0	0	0	0	0	0
Connecticut	0	0	0	39	33	44	0	0	0	1	1	1
MID. ATL.												
New York [3]	16	2	2	273	268	302	0	0	0	6	14	7
New Jersey	4	2	1	95	136	103	0	0	0	5	1	1
Pennsylvania	2	1	2	137	234	312	0	0	0	6	3	7
E. NO. CEN.												
Ohio	5	7	2	259	212	338	0	0	1	18	6	6
Indiana	0	5	1	99	114	143	10	1	3	1	4	2
Illinois	4	5	2	196	294	324	0	7	5	1	8	8
Michigan [3]	0	2	2	141	154	406	1	5	1	7	1	1
Wisconsin	1	17	2	140	146	155	1	2	6	1	2	1
W. NO. CEN.												
Minnesota	2	2	2	89	67	118	1	18	18	0	0	0
Iowa	0	4	1	42	102	92	4	3	10	0	1	0
Missouri	0	3	1	49	54	122	3	0	5	2	2	5
North Dakota	1	2	0	21	3	26	0	1	1	1	0	0
South Dakota	1	3	0	50	16	18	0	0	2	1	0	0
Nebraska	0	2	0	13	33	27	0	0	0	1	0	0
Kansas	1	1	0	88	82	151	1	0	0	1	3	2
SO. ATL.												
Delaware	0	0	0	22	12	12	0	0	0	0	0	1
Maryland [3]	1	0	0	61	39	51	0	0	0	4	1	3
Dist. of Col.	0	0	0	15	15	12	0	0	0	1	0	1
Virginia [3]	3	5	1	97	52	55	0	0	0	5	5	4
West Virginia	1	5	0	51	43	52	1	0	0	5	0	5
North Carolina [3]	1	1	1	99	105	88	0	0	0	6	2	4
South Carolina [2]	3	0	0	17	20	11	0	0	0	3	3	3
Georgia [2]	2	1	1	42	27	27	0	0	1	5	8	4
Florida [2]	0	2	0	7	5	9	0	0	0	2	5	2
E. SO. CEN.												
Kentucky	2	3	1	100	96	68	0	0	0	9	4	3
Tennessee	12	0	1	58	51	45	1	0	0	4	7	7
Alabama [2]	8	1	1	42	35	33	0	0	0	0	5	4
Mississippi [2 3]	3	1	1	25	22	18	0	0	0	3	1	1
W. SO. CEN.												
Arkansas	1	0	1	5	13	16	1	1	2	7	2	3
Louisiana [2]	3	1	1	14	7	9	0	0	0	9	14	7
Oklahoma	2	1	1	24	20	20	1	0	3	2	1	6
Texas [2]	2	2	4	67	37	100	0	0	2	8	10	24
MOUNTAIN												
Montana	0	0	0	48	16	30	0	3	4	0	1	1
Idaho	0	0	0	3	12	24	0	0	1	0	0	1
Wyoming	0	0	0	8	7	12	0	0	0	0	0	0
Colorado	0	1	0	28	33	33	0	0	22	0	0	0
New Mexico	0	0	1	12	17	17	0	0	0	3	3	5
Arizona	0	0	0	4	4	5	0	0	0	0	0	0
Utah [3]	0	1	1	22	13	19	0	0	0	0	0	0
Nevada	0	0	------	2	0	------	0	0	------	0	1	------
PACIFIC												
Washington	2	3	1	25	35	57	0	0	2	0	1	1
Oregon	2	0	0	20	20	40	0	8	8	2	0	2
California	2	5	5	136	99	214	0	1	3	5	2	6
Total	99	91	68	3,091	2,974	3,834	25	50	119	140	127	144
49 weeks	8,904	9,600	7,125	118,622	146,519	175,202	1,322	2,292	9,280	8,309	9,286	13,857

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 6, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, week ended Dec. 6, 1941	Whooping cough, week ended Dec. 7, 1940
NEW ENG.		
Maine	36	66
New Hampshire	19	2
Vermont	13	7
Massachusetts	218	272
Rhode Island	36	7
Connecticut	58	61
MID. ATL.		
New York [1]	675	473
New Jersey	259	171
Pennsylvania	165	678
E. NO. CEN.		
Ohio	229	305
Indiana	17	13
Illinois	281	140
Michigan [3]	282	342
Wisconsin	354	161
W. NO. CEN.		
Minnesota	72	111
Iowa	22	27
Missouri	9	51
North Dakota	10	17
South Dakota	9	3
Nebraska	2	7
Kansas	84	121
SO. ATL.		
Delaware	11	30
Maryland [3]	28	81
Dist. of Col	20	14
Virginia [2]	85	75
West Virginia	40	33
North Carolina [2]	142	243
SO. ATL.—con.		
South Carolina [2]	44	23
Georgia [2]	7	26
Florida [2]	10	9
E. SO. CEN.		
Kentucky	90	67
Tennessee	43	15
Alabama [2]	21	26
Mississippi [2 3]		
W. SO. CEN.		
Arkansas	30	14
Louisiana [2]	1	9
Oklahoma	4	17
Texas [2]	120	119
MOUNTAIN		
Montana	41	2
Idaho	12	8
Wyoming	13	4
Colorado	50	40
New Mexico	32	16
Arizona	11	19
Utah [3]	31	24
Nevada	8	4
PACIFIC		
Washington	160	62
Oregon	30	8
California	192	316
Total	4,126	4,339
49 weeks	199,121	159,619

[1] New York City only.
[2] Typhus fever, week ended December 6, 1941, 93 cases, as follows: New York, 1; Virginia, 1; North Carolina, 7; South Carolina, 4; Georgia, 44; Florida, 3; Alabama, 9; Mississippi, 1; Louisiana, 11; Texas, 12.
[3] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended November 22, 1941

This table lists the reports from 136 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	2	1	12	0	0	0	7	18
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	7
Manchester	0	------	0	0	0	15	0	0	0	0	16
Nashua	0	------	0	0	0	2	0	0	0	4	7
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	10
Rutland	0	------	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	1	------	0	12	15	27	0	5	0	20	195
Fall River	2	------	0	1	0	17	0	8	0	0	43
Springfield	1	------	0	7	1	10	0	1	0	5	36
Worcester	0	------	0	2	4	8	0	1	0	7	37
Rhode Island:											
Pawtucket	1	------	0	1	0	2	0	0	0	0	15
Providence	5	------	0	2	5	11	0	2	0	30	52
Connecticut:											
Bridgeport	0	------	0	1	1	4	0	0	1	2	30
Hartford	0	------	0	0	6	1	0	0	1	0	52
New Haven	0	------	0	23	1	2	0	2	0	14	54
New York:											
Buffalo	0	------	0	0	6	12	0	3	0	16	115
New York	13	7	2	9	60	95	0	73	4	261	1,375
Rochester	0	------	0	1	1	4	0	0	0	3	57
Syracuse	0	------	0	0	3	3	0	0	1	24	52
New Jersey:											
Camden	0	1	1	0	3	3	0	1	0	6	35
Newark	0	2	0	2	3	10	0	7	0	38	87
Trenton	0	------	0	0	1	2	0	0	0	3	42
Pennsylvania:											
Philadelphia	3	2	2	5	24	69	0	17	3	55	510
Pittsburgh	6	2	1	0	0	22	0	11	0	19	153
Reading	0	------	0	0	0	0	0	0	0	2	22
Scranton	0	------	------	0	------	0	0	------	0	5	------
Ohio:											
Cincinnati	3	------	1	0	1	9	0	5	0	14	118
Cleveland	1	6	1	2	4	22	0	7	0	27	194
Columbus	4	1	1	1	2	5	0	3	0	7	107
Toledo	0	------	0	0	0	5	0	2	0	18	50
Indiana:											
Anderson	0	1	0	1	2	0	0	0	0	1	12
Fort Wayne	1	------	0	0	3	0	0	1	0	0	26
Indianapolis	3	------	2	2	7	20	0	1	2	18	104
Muncie	0	------	0	0	2	0	0	1	0	1	11
South Bend	0	------	0	0	0	1	0	0	0	0	20
Terre Haute	0	------	0	2	1	0	0	0	0	0	14
Illinois:											
Alton	0	------	0	0	2	1	0	0	0	3	7
Chicago	19	1	2	12	22	49	0	28	0	114	703
Elgin	0	------	0	0	2	0	0	0	0	2	12
Moline	0	------	0	0	0	1	0	0	0	3	7
Springfield	1	------	0	0	1	2	0	0	0	0	30
Michigan:											
Detroit	2	------	0	12	8	90	0	8	0	87	233
Flint	0	------	0	0	5	1	0	0	0	6	28
Grand Rapids	0	------	0	2	0	4	0	0	0	15	36
Wisconsin:											
Kenosha	0	------	0	0	1	0	0	0	0	3	7
Madison	0	------	0	1	0	1	0	0	0	0	19
Milwaukee	4	------	0	4	4	17	0	3	0	129	92
Racine	0	------	0	0	0	4	0	0	0	11	6
Superior	0	------	0	1	0	0	0	0	0	3	10
Minnesota:											
Duluth	0	------	0	1	0	3	0	0	0	2	19
Minneapolis	0	------	1	0	1	11	0	1	0	14	95
St Paul	0	------	0	1	1	5	0	2	0	18	59

City reports for week ended November 22, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Iowa:											
Cedar Rapids	0	------	------	0	------	2	0	------	0	0	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	4	------	0	0	0	6	0	0	0	0	25
Sioux City	0	------	------	0	------	0	0	------	0	2	------
Waterloo	1	------	------	0	------	3	0	------	0	2	------
Missouri:											
Kansas City	0	2	1	5	8	12	0	2	0	2	75
St. Joseph	0	------	0	3	7	8	0	0	0	0	28
St. Louis	2	------	0	2	10	19	0	3	1	9	202
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	0	10
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	0	10	0	0	0	0	0	0	2
South Dakota:											
Aberdeen	0	------	------	0	------	3	0	------	0	3	------
Sioux Falls	0	------	0	0	0	1	0	0	0	0	9
Nebraska:											
Lincoln	0	------	------	0	------	0	0	------	0	2	------
Omaha	0	------	0	0	3	3	0	3	0	0	70
Kansas:											
Lawrence	0	1	1	0	0	0	0	0	0	0	2
Topeka	0	1	0	1	2	4	0	1	0	3	14
Wichita	0	------	0	1	1	4	0	1	0	7	30
Delaware:											
Wilmington	1	------	0	1	0	8	0	1	0	0	22
Maryland:											
Baltimore	2	4	2	29	14	9	0	10	0	24	246
Cumberland	0	------	0	2	0	3	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	1	0	0	5
Dist. of Columbia:											
Washington	0	------	0	2	8	14	0	8	0	14	180
Virginia:											
Lynchburg	1	------	0	0	3	0	0	0	1	0	12
Norfolk	1	------	0	0	1	3	0	0	0	1	20
Richmond	3	------	1	0	2	8	0	0	0	0	47
Roanoke	0	------	0	0	0	2	0	0	0	0	8
West Virginia:											
Charleston	0	1	0	1	1	0	0	0	0	0	13
Huntington	1	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	10	1	1	0	0	0	2	14
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	0	3	3	0	0	0	0	15
Wilmington	2	------	0	17	2	1	0	0	0	6	17
Winston-Salem	3	------	0	136	0	3	0	1	0	3	25
South Carolina:											
Charleston	1	9	2	0	2	4	0	0	0	1	21
Florence	0	------	0	0	3	1	0	0	0	0	15
Greenville	0	------	0	0	0	2	0	0	0	0	4
Georgia:											
Atlanta	1	18	2	0	5	10	0	1	0	0	92
Brunswick	0	------	0	0	0	0	0	0	0	1	5
Savannah	0	1	1	2	3	4	0	2	1	0	35
Florida:											
Miami	0	2	0	0	1	0	0	1	0	1	34
St. Petersburg	0	------	0	0	0	0	0	0	0	3	29
Tampa	0	------	0	0	2	0	0	0	0	1	31
Kentucky:											
Ashland	1	------	0	10	1	0	0	2	1	0	10
Covington	1	------	0	1	1	2	0	2	0	0	11
Lexington	0	------	0	0	3	0	0	1	0	3	16
Louisville	0	------	0	3	4	20	0	1	0	35	65
Tennessee:											
Knoxville	0	------	0	0	3	0	0	0	0	0	27
Memphis	1	------	1	1	4	6	0	6	0	16	88
Nashville	0	------	1	0	5	6	0	4	0	3	58
Alabama:											
Birmingham	8	5	1	1	8	12	0	4	0	0	87
Mobile	1	------	2	0	4	2	0	0	0	0	23
Montgomery	1	------	------	0	------	1	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	0	------	1	0	------	2	0	------
Little Rock	1	4	0	0	1	0	0	0	0	4	28
Louisiana:											
Lake Charles	1	------	0	0	1	0	0	0	0	0	1
New Orleans	8	8	2	1	20	4	0	12	2	1	169
Shreveport	0	------	0	0	6	0	0	0	1	0	33

City reports for week ended November 22, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Oklahoma:											
Oklahoma City	1	9	0	0	2	2	0	1	4	0	42
Tulsa	0	------	0	26	2	7	1	1	0	0	22
Texas:											
Dallas	4	------	0	11	7	11	0	1	0	3	72
Fort Worth	0	------	2	2	1	1	0	0	0	1	33
Galveston	0	------	0	0	2	1	0	1	0	0	20
Houston	4	------	0	0	4	10	0	10	0	0	92
San Antonio	1	30	2	0	7	0	0	6	0	2	70
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	11
Great Falls	0	------	0	4	1	0	0	1	0	2	8
Helena	0	------	0	2	0	0	0	0	0	7	4
Missoula	0	3	0	0	0	0	0	0	0	0	12
Idaho:											
Boise	0	------	0	0	1	0	0	0	0	1	8
Colorado:											
Colorado Springs	0	------	0	0	0	1	0	2	0	3	8
Denver	8	17	0	2	1	2	0	2	0	27	73
Pueblo	0	------	0	75	1	2	0	0	0	1	7
New Mexico:											
Albuquerque	0	------	0	0	0	0	0	4	0	1	5
Arizona:											
Phoenix	1	30	--------	0	-------	0	0	-------	0	0	--------
Utah:											
Salt Lake City	0	------	1	1	2	2	0	0	0	4	34
Washington:											
Seattle	0	------	1	1	2	2	0	2	0	28	83
Spokane	0	------	0	0	1	3	0	0	0	4	26
Tacoma	0	------	0	0	1	0	0	0	1	6	29
Oregon:											
Salem	0	------	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	4	11	4	7	4	0	0	18	0	19	347
Sacramento	0	------	0	0	3	0	0	0	0	0	41
San Francisco	1	1	0	3	3	4	0	8	0	10	189

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:			
Boston	2	0	0
New York:			
Buffalo	1	0	0
New York	4	1	3
Rochester	0	0	3
Syracuse	0	0	2
New Jersey:			
Newark	1	0	0
Pennsylvania:			
Philadelphia	0	0	6
Pittsburgh	0	1	0
Ohio:			
Cincinnati	1	0	1
Illinois:			
Chicago	3	0	4
Michigan:			
Detroit	2	0	1
Minnesota:			
Duluth	0	0	2
Minneapolis	0	0	2
St. Paul	0	0	1
Iowa:			
Waterloo	1	1	0
Maryland:			
Baltimore	0	0	1
District of Columbia:			
Washington	0	0	1
West Virginia:			
Huntington	0	0	1
Tennessee:			
Nashville	0	0	5
Alabama:			
Birmingham	0	0	1
Texas:			
Dallas	1	1	0
Washington:			
Seattle	0	0	1
California:			
San Francisco	1	0	0

Encephalitis, epidemic or lethargic.—Cases: Worcester, 1; New York, 2; St. Joseph, 1; Fargo, 1; Wichita, 1; Great Falls, 1. Deaths: New York, 1; Philadelphia, 1; Omaha, 1; Wichita, 1; Great Falls, 1.

Pellagra.—Cases: Kansas City, 1; Charleston, S. C., 2; Savannah, 3; Birmingham, 1.

Typhus fever.—Cases: Charleston, S. C., 2; Savannah, 2; Nashville, 1; Montgomery, 3.

Rates (annual basis) per 100,000 population for a group of 90 selected cities (population, 1940, 33,929,112)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Nov. 22, 1941	17.06	21.05	5.84	65.78	55.79	114.03	0.00	45.95	2.92	183.03
Average, 1936-40	23.77	36.19	5.44	136.69	73.78	138.40	1.09	48.93	4.66	176.61

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on November 7, 1941, at Paauhau, Hamakua District, Island of Hawaii, T. H., has been proved positive for plague.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Weeks ended November 1 and November 8, 1941.—During the weeks ended November 1 and November 8, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Week ended November 1, 1941

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis			1	1	4				5	11
Chickenpox		12		96	347	55	53	21	102	686
Diphtheria		19	2	27	4	8	16		2	78
Dysentery				4						4
Influenza		8			1				27	36
Lethargic encephalitis							[1] 1			[1] 1
Measles				270	93	10	6	1	20	400
Mumps		1		256	104	40	109	1	68	579
Pneumonia		4			11	2	1	1	5	24
Poliomyelitis		1	6		2	3	2		1	15
Scarlet fever		14	8	96	206	5	21	23	19	392
Tuberculosis	2	13	13	105	48	2		1		184
Typhoid and paratyphoid fever				6	1	1	12	2	1	23
Whooping cough		7	3	115	146	2	7		31	311

[1] Encephalomyelitis.

Week ended November 8, 1941

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1		5	5	2			2	15
Chickenpox		5		232	229	18	68	5	128	685
Diphtheria	1	19	2	33	2	1	11			69
Dysentery				9	10				1	20
Influenza		12			4	2			30	48
Lethargic encephalitis						2	[1] 5			7
Measles				316	75	1	8	1	12	408
Mumps				206	89	49	44	4	116	508
Pneumonia		2			7	1			10	20
Poliomyelitis		1	11	1	4			1	2	20
Scarlet fever		12	7	145	208	21	14	11	19	437
Trachoma									1	1
Tuberculosis	4	4	1	84	41	43				177
Typhoid and paratyphoid fever		2		26	1		3			32
Whooping cough			2	256	163	3	3		50	477

[1] Encephalomyelitis.

COSTA RICA

Communicable diseases—October 1941.—During the month of October 1941, certain communicable diseases were reported in Costa Rica as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	13	1	Scarlet fever	5	
Influenza	250	1	Typhoid and paratyphoid fever	11	

FINLAND

Communicable diseases—September 1941.—During the month of September 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	120	Poliomyelitis	9
Dysentery	2	Scarlet fever	165
Influenza	522	Typhoid fever	41
Paratyphoid fever	219		

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

China—Fukien Province.—A report dated November 22, 1941, states that bubonic plague in epidemic form has appeared at Shaowu and Yangkow in the interior of Fukien Province, China.

New Caledonia.—On November 21, 1941, two cases of pneumonic plague with two deaths were reported in New Caledonia, one of the cases being in Noumea and the other in a native village 12 miles from Noumea. It is reported that quarantine measures have been taken in all areas which it is suspected may be infected.[1]

Yellow Fever

Colombia.—Deaths from yellow fever have been reported in Colombia as follows: Intendencia of Meta—Villavicencio, October 30, one; November 7, one. Santander Department—Bolivar, October 14, one; October 17, one; San Vincente de Chucuri, October 24, one; October 30, one.

French West Africa.—During the period November 1–10, 1941, five cases of yellow fever were reported in French West Africa, no specific location being given.

Gold Coast—Mepom.—On November 3, 1941, one suspected case of yellow fever with one death was reported in Mepom, Gold Coast

[1] For report of outbreak of plague in New Caledonia earlier in the year see PUBLIC HEALTH REPORTS July 4, 1941, p. 1408.

HEALTH OF ADOLESCENTS IN BUENOS AIRES, ARGENTINA

During the first quarter of 1940, the division of school hygiene of the National Department of Health in Buenos Aires examined 27,000 young persons 12 to 18 years of age. In general, 10.5 percent presented an anomaly of some kind, not including dental caries, which was found in 34 percent of those examined. Twenty-eight percent of the younger children had some infection exclusive of the eyes (15 to 21 percent) and ears (5 to 8 percent). The pathologic index of the older children was about one-sixth that of the younger group.

Good general health conditions were found in 96 percent of the older children, with 4 percent showing a lower health index, consisting of chronic nutritional disturbances, together with congenital or other defects associated with partial deficiencies (statistics covering 500,000 elementary school children showed nutritional impairment in 3 percent). In the group examined, the incidence of hypertrophy of the tonsils and adenoids was 0.52 percent, as compared with 9.6 percent in children of elementary school age. This difference is attributed to spontaneous regression and medical care. Ocular disturbances were found in 5.4 percent of the older group, as compared with an incidence rate three times greater in elementary school children, a difference considered due to corrective measures.

The functions of the division of school hygiene consist not only in diagnosis and statistical surveys, but in taking measures for early treatment.—*J. Am. Med. Assoc.*, Aug. 16, 1941.

UNFITNESS FOR MILITARY SERVICE IN ARGENTINA

In 1928, 25.3 percent of recruits were found unfit for military duty. This percentage rose to 42.1 in 1939. The causes of unfitness assigned in 1939, in a report on 12,893 recruits in Buenos Aires, were as follows: Insufficient body size, 126; underweight, 366; insufficient chest index, 3; constitutional weaknesses, 1,527; nutrition and metabolic disorders, 68; endocrine dysfunction, 10; respiratory disorders, 60; digestive disorders, 1,613; circulatory disorders, 150; urogenital disturbances, 116; cutaneous disturbances, 356; auditory disturbances, 58; ophthalmologic disturbances, 315; nervous disturbances, 54; disturbances of hemopoietic organs, 5; allergies and poisoning, 10; infectious diseases, 4; tuberculosis, 44; congenital malformation, dystrophia, deformation and mutilation, 997; traumas, 94; and tumors, 6. These conditions were found in 6,175 (47.1 percent) of the 12,893 recruits.—*J. Am. Med. Assoc.*, Aug. 16, 1941.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports, and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93, title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2 50 a year

Public Health Reports

VOLUME 56 DECEMBER 19, 1941 NUMBER 51

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56 • DECEMBER 19, 1941 • *No. 51*

QUANTITATIVE STUDIES OF THE TUBERCULIN REACTION

II. The Efficiency of a Quantitative Patch Test in Detecting Reactors to Low Doses of Tuberculin [1]

By MICHAEL L. FURCOLOW, *Passed Assistant Surgeon, United States Public Health Service*, and EDWARD L. ROBINSON, M. D., *Chief Resident Physician, Ohio Soldiers' and Sailors' Orphans' Home, Xenia, Ohio*

It was shown in a previous paper (*1*) that an intracutaneous tuberculin test using 1/10,000 mg. of Purified Protein Derivative (PPD) separates, with considerable accuracy, any population into two groups: (1) Those who are tuberculous or who have had contact with the tuberculous; and (2) those who have had, insofar as can be determined, no contact. For example, over 99 percent of a group of 468 adults with active tuberculosis reacted positively to the 1/10,000 mg. test dose, but fewer than 10 percent of a group of 309 children with no known history of contact with tuberculosis reacted to this test dose.

If, therefore, 1/10,000 mg. of PPD be accepted as the most efficient tuberculin testing dose, there immediately arises a question as to whether an efficient patch test can be developed that will detect all or almost all persons who react to this dose but only a minimum number of those who react to larger doses. The present study, a comparison of a quantitative patch test with the quantitative intracutaneous test, represents an attempt to answer this question.

No review of the literature on the patch test is presented here. For such a review, see Keresztúri (*2*).

MATERIAL AND METHODS

Quantitative evaluation of the tuberculin sensitivity of a large group of persons, as previously reported (*1*), has enabled us to determine the smallest dose of tuberculin PPD to which each person in the group reacts positively. The dose (in mg.) to which a person reacts deter-

[1] From the Division of Public Health Methods, National Institute of Health, and the Children's Hospital Research Foundation, Department of Pediatrics, University of Cincinnati.

mines what we have called his *sensitivity level.* Knowledge of the tuberculin sensitivity level for each child in an orphanage in Ohio made that group an excellent population to use for the patch test study. The characteristics of the orphanage group have been previously reported. Some had a history of contact with cases of tuberculosis; others had had no known contact; but no significant active tuberculosis was found among either the children or the adults in the institution.

The patch test was performed on a total of 612 white children, aged 6 to 19 years. Of this group, 469 had been the subjects of quantitative intracutaneous tuberculin tests about 6 months before patch testing was done. Sensitivity levels were known, therefore, for the 469 children, but not for the remainder, 143, who had been admitted to the institution subsequent to the earlier study. In the light of the results of the quantitative study, the 143 children were, at the time of patch testing, given a single intracutaneous dose of 1/10,000 mg. of the same lot (98970) of PPD with which the previous sensitivity levels had been determined. Comparisons of patch test reactions with reactions to intracutaneous tests are therefore made in two ways: For the larger group, the sensitivity levels determined 6 months earlier are compared with the reactions to the several patches; in the smaller group, comparisons are made only on the basis of positive or negative reaction to the single, simultaneously administered diagnostic dose (1/10,000 mg. intracutaneously).

The quantitative method referred to above consists of injecting, in successive tests, a graduated series of doses of tuberculin PPD until either a positive reaction is induced or the largest dose in the series has been given. Reactions to intracutaneous tests are read at 24, 48, and 72 hours and measurements, in mm., are recorded for two diameters of edema and erythema. The term "positive reaction" as used here describes an area of edema with a mean diameter of at least 5 mm. at the 48-hour reading.

The patch test.—Under the direction of Dr. Florence Seibert, Sharpe and Dohme, Inc., prepared the patch tests, each of which consists of a strip of adhesive tape 1 inch wide and 3 inches long, on which are placed three pieces of filter paper about 1 cm. square. On each piece of filter paper a drop of the appropriate tuberculin solution is placed and allowed to dry.[2] Old Tuberculin (OT) and two different concentrations of PPD, prepared as follows, are used.

(1) Old Tuberculin (OT) was prepared in the usual manner. Dorset's synthetic medium was used to grow the bacilli, and the culture was concentrated and filtered as usual in the preparation of commercial Old Tuberculin. This OT was comparable in potency

[2] Since it has appeared from the reactions that there had been some diffusion of the tuberculin solution into the adhesive tape about the paper squares, it is believed that a preferable technique is to dip the filter paper in the tuberculin solution and allow it to dry before placing it on the adhesive tape.

to the International Standard OT when tested on tuberculous guinea pigs.

(2) The PPD used was the New International Standard made by Doctor Seibert and stored in its lyophilized state. It is a very potent product and is expected to serve as the standard of potency for all PPD preparations. The dried powder was diluted to the required concentration (either 1.0 percent or 0.1 percent) by adding 20 percent glycerine in phosphate buffer solution. At the suggestion of Doctor Seibert, the glycerine was added to aid in the skin absorption of the tuberculin. Two concentrations of PPD (1.0 percent and 0.1 percent) were used so as to make possible a quantitative evaluation of the reaction to the patch test. Concentrations of less than 0.1 percent were not used since preliminary tests with them had not been satisfactory.

The patch tests, applied after cleaning the skin with acetone, were left in place for 48 hours, and readings were made 48 hours after removal. Later experience convinced us that final reading could well be delayed until 3 to 5 days after removal of the patch.

Reactions to patch tests were classified as follows:

Classification	*Reaction*
Negative	None.
Doubtful	Questionable, occurring especially when the individual was sensitive to adhesive tape. Such reactions were considered "negative" in the analysis.
One plus	One or more definite papules in the area upon which the filter paper square had been placed.
Two plus	Papules outlining the entire area of the filter paper square.
Three plus	Papules or erythema extending beyond the area of the square. A few such reactions resulted in vesiculation and scaling.

For purposes of comparison, two different areas of the body were used for patch tests. The girls in the study group were tested on the right shoulder, on the fleshy curving part of the trapezius muscle midway between the acromion of the scapula and the spinous processes of the cervical vertebrae. The site described is an excellent one, since it discourages the children from removing the patch test and also assures excellent contact owing to the rounded muscle contour and the pressure of the clothes. The boys in the study group were patch tested on the left lower arm at least one inch below the elbow on the flexor surface. Hairy areas were avoided insofar as possible, and most of the patch tests were placed diagonally on the arm. Such patch tests as the children removed or lost before the proper removal time were replaced by new ones. Only one girl removed or lost a patch test but about 20 boys had to have replacements. In view of this fact it is felt that the shoulder or upper arm is preferable to the lower arm as a test site. No harmful reactions resulted in

either area, and no significant differences could be detected between reactions in the two areas.

RESULTS

Results of patch tests on 469 children for each of whom the tuberculin sensitivity level is known.—Table 1 and figures 1, 2, and 3 give the

TABLE 1.—*Comparison of the reaction to the patch test with three different patches with that to the intracutaneous quantitative tuberculin tests among 469 children aged 6–19 years*

Patch test	Degree of reaction	Level of tuberculin sensitivity (in mg.) by intracutaneous method													
		Number							Percent						
		0.00001	0.0001	0.001	0.01	0.1	1.0	Neg. 1.0	0.00001	0.0001	0.001	0.01	0.1	1.0	Neg. 1.0
Old Tuberculin	Negative	4	6	54	111	129	39	21	4.5	37.5	91.5	97.4	98.4	100 0	100.0
	One plus	8	2	3	2	1	---	---	9.0	12.5	5.1	1.7	.8	-----	-----
	Two plus	24	5	2	1	----	---	---	27.0	31.3	3.4	.9	-----	-----	-----
	Three plus	53	3	---	----	1	---	---	59.5	18.7	-----	-----	.8	-----	-----
	Total	89	16	59	114	131	39	21	100.0	100.0	100.0	100 0	100.0	100.0	100.0
0.1 percent PPD	Negative	13	10	59	113	131	39	21	14.6	62.5	100.0	99 1	100.0	100.0	100.0
	One plus	29	4	---	1	----	---	---	32 6	25.0	-----	.9	-----	-----	-----
	Two plus	28	1	---	----	----	---	---	31.5	6.3	-----	-----	-----	-----	-----
	Three plus	19	1	---	----	----	---	---	21.3	6.3	-----	-----	-----	-----	-----
	Total	89	16	59	114	131	39	21	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1.0 percent PPD	Negative	1	5	44	109	127	38	20	1.1	31.3	74 6	95 6	96.9	97.4	95 2
	One plus	4	2	8	4	3	1	1	4.5	12.5	13 6	3.5	2.3	2.6	4.8
	Two plus	5	3	3	----	1	---	---	5 6	18.8	5.1	-----	.8	-----	-----
	Three plus	79	6	4	1	----	---	---	88.8	37.5	6.8	.9	-----	-----	-----
	Total	89	16	59	114	131	39	21	100.0	100.0	100.0	100.0	100.0	100.0	100.0

results of the patch tests, classified according to the individual tuberculin sensitivity levels obtained by quantitative intracutaneous tests. The degree of reaction to each of the three patches is recorded separately. It is evident from study of this material that, of the three, the 1.0 percent PPD patch was most efficient in detecting persons who react to 1/10,000 mg. or less of PPD given intracutaneously. However, the same patch also detected the largest proportion of persons who react only to doses of more than 1/10,000 mg.

The 1.0 percent PPD patch (fig. 1) missed 6 out of 105, or 5.7 percent, of those who react to 1/10,000 mg. or less of PPD, and picked up 26 out of 364, or 7.1 percent, of those who react only to doses larger than 1/10,000 mg. This patch also produced the largest number of 3-plus reactions.

The OT patch (fig. 2) failed to detect 10 out of 105, or 9.5 percent, of children who react to 1/10,000 mg. or less of PPD but it also detected 10 out of 364, or 2.7 percent, of those who react only to doses of more than 1/10,000 mg. Only two children who reacted to

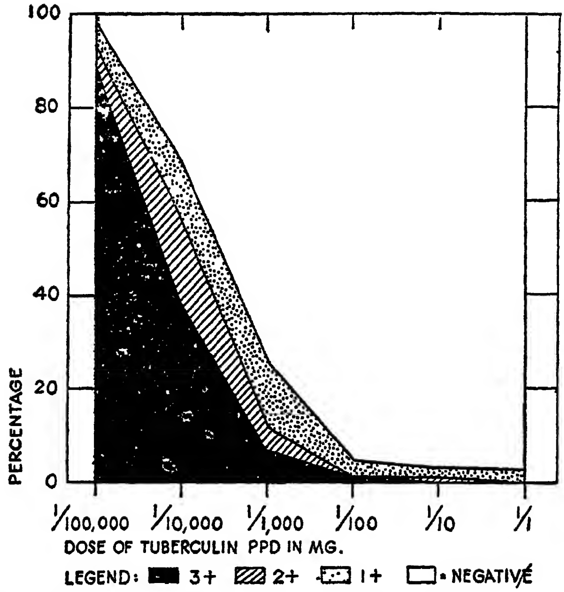


FIGURE 1.—Degrees of reaction to the 1.0 percent PPD patch among reactors to different intracutaneous doses of PPD.

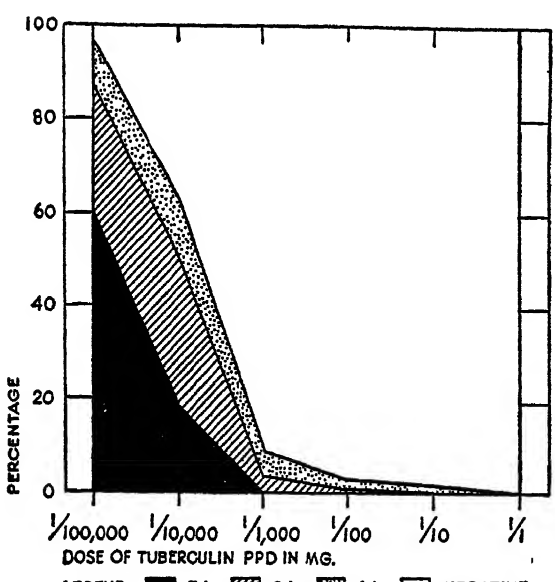


FIGURE 2.—Degrees of reaction to the OT patch among reactors to different intracutaneous doses of PPD.

the OT patch did not also react to the 1.0 percent PPD patch; both of these children had reacted to 1/100 mg. of PPD by the intracutaneous method.

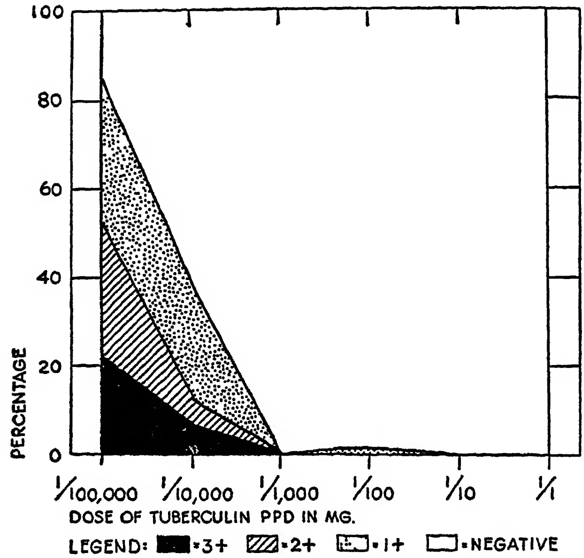


FIGURE 3.—Degrees of reaction to the 0 1 percent PPD patch among reactors to different intracutaneous doses of PPD.

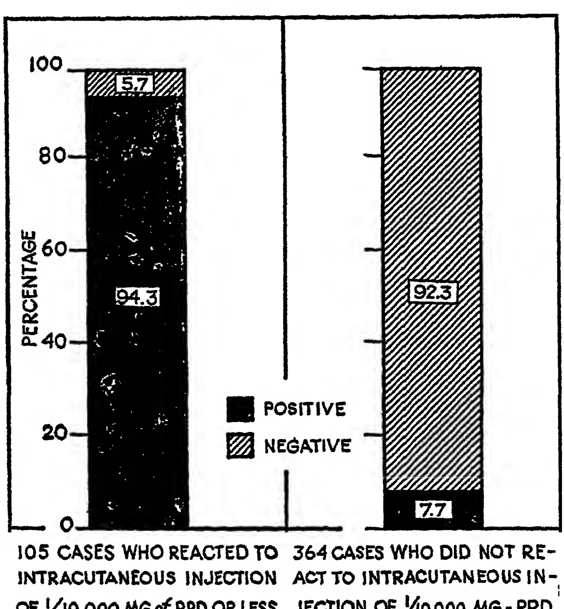


FIGURE 4.—Percentage of reactors to the patch test (any one of the three patches) among reactors and non-reactors to 1/10,000 mg. (or less) of PPD intracutaneously.

The 0.1 percent PPD patch (fig. 3) missed 23 out of 105, or 22 percent, of the reactors to 1/10,000 mg. or less but it picked up only 1 out of 364 of the reactors to the higher intracutaneous doses.

The number reacting to any one of the three patches is only slightly different from the number that react to the 1.0 percent PPD patch. Figure 4 shows that 99 out of 105, or 94.3 percent, of the reactors to 1/10,000 or less mg. of PPD intracutaneously also react to at least one (or all) of the three patches. In addition, 28 out of 364, or 7.7 percent, of those who reacted only to the larger intracutaneous doses reacted also to one or more of the three patches.

Results of simultaneous intracutaneous and patch tests.—Among the 143 children tested, using 1/10,000 mg. of PPD intracutaneously, 18 were positive and 125 were negative. Table 2 and figure 5 compare

TABLE 2.—*Comparison of the reaction to the various patch tests with that to the intracutaneous test with 1/10,000 mg. of PPD, among 143 children aged 6–19 years*

Intracutaneous (PPD 1/10,000 mg.)	Total examined	Patch test: Old Tuberculin		Patch test: 0.1 percent PPD		Patch test: 1.0 percent PPD	
		Negative	Positive	Negative	Positive	Negative	Positive
	Number						
Negative	125	121	4	122	3	118	7
Positive	18	6	12	5	13	1	17
	Percent						
Negative	100.0	96.8	3.2	97.6	2.4	94.4	5.6
Positive	100.0	33.3	66.7	27.8	72.2	5.6	94.4

the results of the intracutaneous tests with those of the patch tests. Details are given for each of the three patches: OT, 0.1 percent PPD, and 1.0 percent PPD.

In figure 5 it is seen that the OT patch picked up only 12 out of 18 of those who reacted to the intracutaneous test. The same patch picked up only 4 out of 125 cases who were negative to the intracutaneous test.

The 0.1 percent PPD patch picked up 13 out of 18 of those positive to the intracutaneous test and only 3 out of 125 of those negative to it.

The 1.0 percent PPD patch picked up 17 out of 18, or 94.4 percent, of the reactors to the intracutaneous test and 7 out of 125, or 5.6 percent, of the nonreactors.

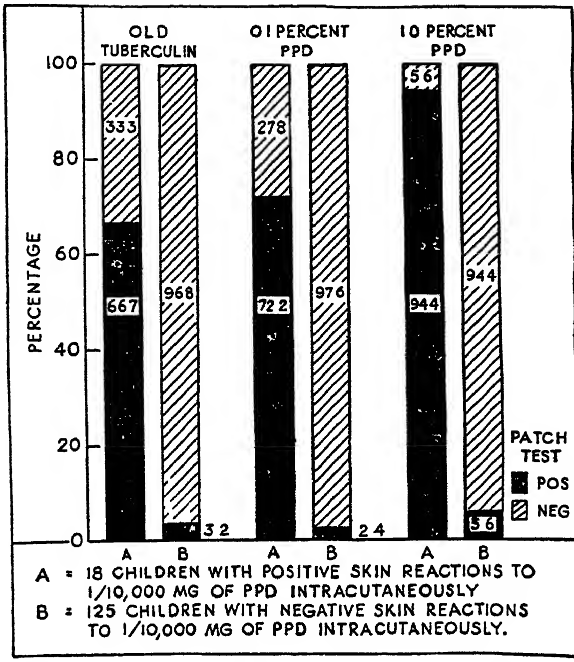


FIGURE 5.—Percentage of positive reactors to the various patches among 143 children arranged by (A) those with positive skin reactions to 1/10,000 mg of PPD intracutaneously and (B) those with negative reactions to this test.

DISCUSSION

The foregoing presents an evaluation of the patch test in comparison with the intracutaneous test with PPD. In a group of 469 children aged 6 to 19 years whose sensitivity level to tuberculin had been quantitatively determined by the use of a number of doses of tuberculin of increasing concentration, it was found that sensitivity to the patch test was directly parallel to the sensitivity as determined by the quantitative intracutaneous method. While a large percentage of the most sensitive persons react to the patch test, the percentage of reactors declines sharply as sensitivity to tuberculin decreases. In a similar manner the severity of the reaction to the patch test decreases as the sensitivity to tuberculin decreases. Furthermore, the percentage of reactors discovered by the several patches varies directly with the potency of the patch; the most potent patch (1.0 percent PPD) discovers the largest number of reactors, and produces the greatest number of 3-plus reactions.

From the data presented, information is made available regarding the relative efficiency of various patches in the detection of persons having different levels of tuberculin sensitivity. An attempt is made especially to evaluate the efficiency of the patch test in detecting

persons who will react to 1/10,000 mg. or less of the particular PPD used in this study since it is felt that almost all the persons who have active tuberculosis and a large percentage of those in contact with active tuberculosis will react to that dose (*1*).

The particular patch test used in these studies detects a large proportion of persons who react to 1/10,000 mg. or less of PPD. Among a total of 612 children tested, of whom 123, or 20.1 percent, were positive to 1/10,000 mg. or less of PPD intracutaneously, the patch test was also positive in 116, or 94.3 percent. This means a loss of 5.7 percent of those whom, in the light of our earlier findings, it is desirable to detect. In addition, the patch test was positive in 36 out of 489, or 7.4 percent, of those who failed to react to the 1/10,000 mg. dose of PPD. It is thus evident that while the total error of the particular patch test used may appear sizeable—6 percent "missed" and 7 percent "extra" reactors—its importance depends upon the size of errors inherent in the method of testing. For example, in another series of observations on the intracutaneous test,[3] in which identical doses of tuberculin were given to an individual in both forearms at the same time and by the same technique, it was found that, for doses of about the level used here (1/10,000 mg.), a negative or doubtful reaction occurred in one arm while a positive reaction occurred in the other arm in 3.3 percent of the cases. It is to be emphasized that this result was obtained by employing *the same dosage of tuberculin from the same syringe in the two arms of the same individual*. It is thus evident that there is a sizeable error in the intracutaneous technique itself. That much greater variation occurs when larger doses of tuberculin are used in the two arms has appeared in our experience and has also been reported by Paretsky (*3*). If several different tuberculin products are used intracutaneously, even in both arms of the same persons at the same time, still larger variations are found (*4*, *5*).

From a study of figures 1 to 4 it appears that OT, as used here, is not superior to PPD as a patch testing material providing glycerine is mixed with the PPD to aid in its absorption. The OT patch used in these tests is of about equal potency to the 0.1 percent PPD patch but is weaker than the 1.0 percent PPD patch.

The 1.0 percent PPD patch was the best for detecting reactors to 1/10,000 mg. of PPD but, as might be expected, it also uncovered the largest proportion of reactors to the larger doses. It is possible that the 1.0 percent patch may induce too severe reactions in persons with active tuberculosis. However, in a limited experience with adults, no severe reactions were encountered. The optimal strength of tuberculin in the patches and the frequency of severe reactions remain to be

[3] To be published elsewhere.

determined by further experience with the test. It seems quite evident, however, that the patch test as used in this study is very efficient in detecting persons who are highly sensitive to tuberculin or react to relatively small doses. As shown in our previous paper, it is among these very persons that one will encounter almost all the individuals infected with tuberculosis. Hence, for case-finding surveys, the patch test may well prove more efficient than the intracutaneous test, if the well known loss through "refusal of the needle" is taken into account.

SUMMARY

The efficiency of the patch test in detecting reactors to tuberculin has been shown to depend on:

(1) The tuberculin sensitivity of the individual—the more sensitive the person the greater is the likelihood of his reacting to the patch test.

(2) The potency of the patches employed—the most potent patch will detect the most reactors. In this study the 1.0 percent PPD patch was the most potent. The OT and 0.1 percent PPD patches were weaker, and of about equal strength.

The site of application of the patch test seems to have little relation to the efficiency of the test.

If it is accepted that reactors to 1/10,000 mg. or less of PPD include most or all persons whom it is desirable to detect in a routine survey (*1*), the patch test as used in these studies will detect such persons with an error of about 6 percent "missed" and 7 percent "extra" reactors.

It should be noted that the New International Standard PPD was employed in the patch tests in this series and that 20 percent glycerine was mixed with it to aid in skin absorption.

ACKNOWLEDGMENTS

The authors wish to express their thanks to Dr. Florence B. Seibert for arranging for the preparation of the patch tests used in this study. Thanks are also due to the Medical Research Division of Sharp and Dohme, Inc., for furnishing these patch tests for experimental purposes.

The cooperation of Captain Harold L. Hays and Captain F. R. Woodruff and the entire staff of the Ohio Soldiers' and Sailors' Orphans' Home is gratefully acknowledged.

Appreciation is expressed to Passed Assistant Surgeon Carroll E. Palmer for his advice and encouragement.

REFERENCES

(*1*) Furcolow, M. L., Hewell, B., Nelson, W. E., and Palmer, C. E.: Quantitative studies of the tuberculin reaction. I. Titration of tuberculin sensitivity and its relation to tuberculous infection. Pub. Health Rep., **56**:1082–1100 (1941).

(*2*) Keresztnri, C.: Present status of the tuberculin patch test. Am. Rev. Tuberc., **44**: 94–103 (1941).

(3) Paretsky, M.: Intracutaneous tuberculin test; clinical investigation of some factors involved. Am. Rev. Tuberc., 38: 81–95 (1938).
(4) Lumsden, L. L., Dearing, W. P., and Brown, R. A.: Questionable value of skin testing as a means of establishing epidemiological index of tuberculous infection. Am. J. Pub. Health, 29: 25–34 (1939).
(5) Savage, C. L.: Comparison of reactions to different tuberculins in the same individuals. Am. Rev. Tuberc., 43: 527–533 (1941).

STUDIES OF THE ACUTE DIARRHEAL DISEASES [1]

V. AN OUTBREAK DUE TO *SALMONELLA TYPHI MURIUM*

By W. E. Mosher, Jr., *Assistant District Health Officer*, S. M. Wheeler, *Epidemiologist*, H. L. Chant, *District Health Officer, New York State Department of Health*, and A. V. Hardy, *Consultant, United States Public Health Service and Associate Professor of Epidemiology, DeLamar Institute of Public Health, Columbia University*

The outbreak described in this paper was encountered in an institution in which a study of diarrheal disorders was in progress. The investigation revealed a relatively high incidence of endemic *Shigella dysenteriae* infections, but during a period of 18 months Salmonella were encountered only in this outbreak. Its occurrence provided an opportunity for certain comparative observations of Shigella and Salmonella infections, to which particular attention will be given in this report.

The institution concerned provides for the training and custodial care of the mentally defective of all ages, except infants. With the exception of one case in a matron, the infections were limited to inmates. There were 238 clinical cases, in 86 (36.1 percent) of which the diagnosis was established by the isolation of *Salmonella typhi murium*. Two passive carriers were also discovered.

CLINICAL NOTES

The limited information was obtained from the physicians in charge of the cottages and hospital, the matrons in the cottages, and from our own examinations. Characteristically the illnesses had a sudden onset and a relatively severe though brief course. The prominent observations were fever, diarrhea, and vomiting, and the most frequent complaints were abdominal cramps, headache, backache, and dizziness. The temperature varied with the severity; it was occasionally low grade, but in more than half of the cases it was above 101° F. *per os*, and in 11 percent above 103° F. The stools were watery, often green, and in rare instances contained gross blood. The vomiting tended to be persistent and distressing. The patients usually appeared

[1] From the Division of Infectious Diseases, National Institute of Health, U. S. Public Health Service; the New York State Department of Health, and the DeLamar Institute of Public Health, Columbia University, with the assistance of the Division of Laboratories of the New York City Department of Health.

toxic and quite ill. The prominent physical finding was diffuse abdominal tenderness, in many cases with moderate to even marked rigidity. It was reported that severe rigors occurred in five cases. The usual duration of symptoms was 2 to 3 days; the most persistent illness lasted less than 1 week. There was one fatal case, a 32-year-old inmate who died after 24 hours of diarrhea, vomiting, and hyperpyrexia.

EPIDEMIOLOGY

The institution has a rural location. The 3,900 inmates are housed in 40 cottages which are distributed over a rolling wooded area about 1 mile long and one-half mile wide. There are four conveniently located service buildings, each with a large kitchen, a dining room for inmates and another for employees. Located elsewhere are two small kitchens which serve employees exclusively and one which provides for the hospital. The food for the low grade defectives and for those with physical disabilities is prepared in the service buildings and transported to the cottages.

In this outbreak the cases, with one exception, were limited to the inmates of the 12 cottages which are associated with one of the service buildings. Eight of these cottages housed women who went to the dining room for their meals, and four provided for the "infirm" females of all ages who ate food prepared in the same kitchen but served to them in the cottage. An average of 170 paid employees were also served from this kitchen, but the only case among these was in a matron who gave a history of having sampled a portion of food prepared for the inmates. The attack rates by cottages and groups are shown in table 1. Those living elsewhere and using food prepared in the six other kitchens remained free of infection. Five inmate helpers who lived in the cottages involved, but who worked and had their meals in other parts of the institution, became infected late in the epidemic. The relatively late onsets in these cases may be seen in table 2. These are considered secondary infections acquired through contact in the cottages with the primary cases.

The age distribution of the cases ranged from 6 to 77 years. There were no significant variations in attack rates according to age. The majority of the patients from the cottages for the high grade defectives, where most of the cases occurred, were between the ages of 15 and 30.

The epidemic was explosive in character, as is apparent from the distribution of onsets shown in table 2. Symptoms began to appear during the forenoon of November 24, 1939, when four persons became ill. More than one-half of the cases developed symptoms during the following day. In every cottage for the high grade defectives the largest number of patients became ill on this day. In the

TABLE 1.—*Distribution of cases among inmates and employees who obtained food from different sources*

Source of food	Total served	Cases	
		Number	Percent
Women's kitchen and inmates' dining room (high grade group):			
Cottage I	83	19	22.9
Cottage J	76	45	59.2
Cottage K	71	27	38.0
Cottage L	15	6	40.0
Cottage M	32	20	62.5
Cottage N	85	19	22.4
Cottage O	69	35	50.7
Cottage P	88	20	22.7
Women's kitchen and cottage dining rooms (infirm group):			
Cottage Y	123	5	4.1
Cottage Z	120	10	8.3
Cottage Alpha	120	6	5.0
Cottage Beta	118	20	16.9
Women's kitchen and employees' dining room	[1] 170	[2] 1	0.6
All other kitchens and dining rooms		[3] 5	0.1
Total	[1] 3,830	238	

[1] Daily average attendance.
[2] Reported sampling the inmates' food.
[3] Lived in cottages L, M, and O, had daily contact with patients during outbreak, and believed to be secondary infections.

TABLE 2.—*Onsets as related to probable dates of exposure in a Salmonella and a Shigella outbreak*

Days following probable exposure	Cases with onset					
	Salmonella outbreak				"Newcastle" outbreak	
	Primary	Secondary	Total		Number	Percent
			Number	Percent		
0	0	0	0	0	1	1.0
1	25	0	25	10.7	12	12.4
2	125	0	125	53.9	43	44.3
3	37	0	37	16.0	26	26.8
4	28	1	29	12.4	6	6.2
5	8	1	9	3.9	7	7.2
6	4	1	5	2.2	2	2.1
7	0	0	0	0	0	0
8	0	2	2	.9	0	0
Unknown	6	0	6		0	0
Total	233	5	238	100.0	97	100.0

cottages for the "infirm" the stated dates of onset tended to be later. This may be ascribed to the fact that the date recorded was usually the day on which the patient was kept in bed. From consideration of the known short incubation period in Salmonella infections and the close grouping of the dates of onset, the most probable date for the spread of the infection appeared to be November 23 (Thanksgiving Day). This opinion was supported by the record of three cases in inmates who ate in the suspected dining room only on Thanksgiving Day and of the matron who sampled the inmates' food. All four were typical cases with vomiting, diarrhea, abdominal pain, and fever, and all had stool cultures positive for *S. typhi murium*.

It was evident that an explosive epidemic of this character and of limited distribution would not arise through person-to-person contact. In this institution the water could not be suspected since it had a general distribution to all inmates and employees and was satisfactorily chlorinated. The milk was produced in the institution's dairy, was pasteurized, and delivered in cans to the cottages for the infirm and to the dining room. Investigation of the source and handling of the milk revealed no obvious possibility of contamination of that portion of the supply which would reach only the inmates of the affected cottages. The evidence definitely pointed to some food prepared in the one kitchen for inmates and not served to the paid employees.

The breakfasts of November 23 and 24 contained only foods served to both inmates and employees; this was true also of the cake, apples, nuts, and milk served for supper on November 23. For Thanksgiving dinner the following foods were provided: roast turkey and dressing, giblet gravy, mashed white and sweet potatoes, cranberries, sweet cider, pickles, and mince pie. The potatoes, cranberries, and pickles were served from one supply to both inmates and employees. The cider was not sent to the infirm group in which cases of infection occurred but did go to employees who were free of infection. There were but two dishes which differed for the inmate and the employee groups, the turkey with dressing and gravy, and the mince pie. The composition of the latter as served to the inmates was green tomatoes, raisins, apples, sugar, and spices. Neither meat nor eggs were included. It is improbable that Salmonella would be introduced in this food or would survive and multiply if introduced. Additional evidence against the mince pie was the definite history that it was not eaten by the one employee who became ill nor by the low grade defectives who also became infected.

In contrast to these negative observations a limited amount of reliable information tended to incriminate the turkey. The statement of the matron who became ill was particularly definite. There were two bed patients under her care. Trays were prepared in the kitchen and carried to the cottage. When she was about to take these to the patients she reported thinking, "My, that turkey looks good," and then picked up a small piece in her fingers and ate it. She was equally certain that she did not sample the pie or any other food. She became ill on November 25, the day of onset of a majority of the cases. Of the two bed patients whom she served, one later developed diarrhea with stool culture positive for *S. typhi murium*. In the cottages other than those for the infirm the turkey was eaten freely by all, but the low grade defectives often refused this solid food. Among them the infection rates were low. Another possible reason for the low attack rate among the infirm group was that trays were sent from

the kitchen to these cottages 2 hours before lunch was served to the high grade defectives in the dining hall. This extra 2 hours at room temperature may have allowed a heavier bacterial growth in the contaminated food.

The fowl purchased for the inmates came from a different source and was of a different grade than those served the employees. All the turkeys for the inmates were purchased from one company and were delivered in unbroken barrels to the different kitchens. Thirty-six birds were used by the inmates who became ill. On November 22 these were plucked, dressed, washed, and some but not all the birds were filled with a dressing consisting of bread crumbs, spice, and onions. Most of them were then cooked for 2 hours in individual compartments in a pressure steamer and a few in steam jacketed ovens. The temperature or pressure maintained was not known but it was agreed that the birds were well cooked. Overnight the cooked birds were stored in the cold room but were removed early Thanksgiving morning and remained at kitchen temperature for 4 to 5 hours. They were browned in the oven for 30 minutes, then carved, arranged on large platters around the dressing, and served. The giblets were steamed for 2½ hours on November 22 and were then mixed with pan gravy and flour.

Thus, the epidemiological evidence appeared to point to the turkey or its dressing and to raise questions concerning the cooking, but there was no evidence as to the original source of infection. The birds could not be traced to the farm on which they were raised so that it was not possible to determine whether they might have come from an infected flock. There was a difference in attack rate according to seating arrangement of the patients in the dining room. This suggested that certain birds were probably more heavily contaminated than others. There was little evidence of a possible rodent contamination of the turkeys or dressing in the kitchen. Five rats were trapped on the grounds of the institution; none revealed evidence of Salmonella infection.

LABORATORY OBSERVATIONS

The major objective of these studies, in addition to providing an etiological diagnosis, was to measure the duration of the infections from exposure to bacteriological recovery. The stool cultures were performed in the branch laboratory of the State Department of Health in New York City and in the laboratory of the DeLamar Institute. The former shared in the diagnostic examinations and sought for carriers among the food handlers and healthy contacts possibly exposed; the latter assumed responsibility for most of the follow-up examinations and all of the latter ones. The procedure followed was to have the fecal specimens collected in the cottages, and an appropriate

quantity placed directly in tetrathionate or selenite F broth. These were incubated overnight and then four plates were inoculated, using bismuth sulfite, S. S. agar, MacConkey's, and plain desoxycholate. The desoxycholate citrate agar was not employed, as plates prepared from the dehydrated product failed to grow the variety of Salmonella encountered. The organisms were identified by the usual cultural and serologic tests. Our own classification was confirmed by the late Dr. F. Schiff who kindly examined several of the early isolations and all of the very late ones.

The cultural findings by weeks are shown in table 3. The 39 negative and 4 positive cases which were excluded from this tabulation

TABLE 3.—*Persistence of Salmonella typhi murium and Shigella dysenteriae ("Newcastle") infections as determined by fecal cultures*

Week following infection	*Salmonella typhi murium* outbreak			*Shigella dysenteriae* ("Newcastle") outbreak		
	Persons under observation	Total continuing positive cases		Persons under observation	Total continuing positive cases	
		Number	Percent		Number	Percent
First	53	34	64.2	48	44	91.7
Second	72	36	50 0	94	72	76.6
Third	191	61	31.9	94	19	20 2
Fourth	195	41	21.0	94	3	3 2
Fifth	195	18	9 2	94	2	2 1
Sixth	195	13	6.7	94	0	0
Seventh	195	10	5.1	94	0	0
Eighth	195	6	3.1	94	0	0
Ninth	195	4	2 1	94	0	0
Tenth	195	3	1.5	94	0	0
Eleventh	195	2	1.0	94	0	0
Twelfth	195	1	.5	94	0	0
Thirteenth	195	[1] 1	.5	94	0	0

[1] Culture positive up to the end of the eighteenth week.

were either not reexamined regularly or not reexamined at all. The two passive carriers harboured the organisms for 4 and 9 weeks, respectively. Data regarding these carriers were not included in the tabulation.

As stated previously, it is believed that the infection was spread on Thanksgiving Day, November 23. Most of the illnesses began during the next 2 days. The outbreak was not reported until after the week end, on Monday the 27th. On this and the following day, specimens were taken from 14 hospitalized cases. With one exception all cultures yielded organisms subsequently identified as *Salmonella typhi murium*. The second culture on the one case which was negative yielded the same organism. The cases cultured later in the first week included several already recovered. Of the 53 cases examined within 1 week after the date of probable exposure, 26 (49.1 percent) were positive. However, eight of these which failed to give positive results later yielded the specific etiological agent. Thus 34 (64.2 percent) of the

53 cases under observation were positive either during or later than the first week. In the same way observations have been tabulated for each of the following weeks. As the study progressed, most of the cases with three consecutive negative tests were dropped; some which could be tested conveniently were continued to the fourth or fifth negative test. The later tests were, therefore, on those individuals who carried the organisms for more prolonged periods. The duration of the infection was counted from the probable date of exposure to that of the last positive stool culture. Thus it is seen that 31.9 percent harboured the organism for more than 2 weeks, 21.0 percent for more than 3 weeks, and 9.2 percent for more than 4 weeks. At the end of 2 months, four (2.1 percent) were still carriers, but at the end of 3 months there was only one carrier (0.5 percent). This patient was last positive on March 27, more than 4 months following exposure.

For comparison, the duration of *Shigella dysenteriae* ("Newcastle") infections, as found by one of us (A. V. H.) (*1*) in an epidemic involving nurses, is shown in table 3. Within 5 weeks following exposure all of these cases and carriers had become bacteriologically negative.

An adequate search for carriers among those without symptoms was not possible, but some evidence was obtained. In the course of the study of endemic diarrheal diseases routine bi-weekly cultures were being made of the inmates of an affected cottage. In these examinations two inmates with symptoms and one without symptoms yielded *Salmonella typhi murium.* In another cottage 20 inmates were ill and bacteriologically positive, 24 were ill but culturally negative, and 23 were originally considered free of symptoms. The latter were examined once only; two yielded *S. typhi murium.* One of these later admitted that she had had a mild disturbance so she was classified as a case, but the other maintained that she had been well throughout. These findings indicate only that subclinical infections can be identified and call attention to the desirability of ascertaining the relative frequency of their occurrence.

During the period when the individuals were evidently harbouring the organisms, they were successfully isolated by stool culture in approximately two trials out of three.

Blood for agglutination tests was collected 2 weeks after the day of probable exposure from 35 culturally positive cases, 52 negative cases, and from 17 individuals who had been free of symptoms. The highest dilution giving complete agglutination of *S. typhi murium* was 1:40. There was no significant difference in the titers in the three groups. One month later blood was drawn from 44 others. Few showed any agglutination and in only one was this complete in a titer of 1:20. With reactions of this type the agglutination test could have little value as a diagnostic procedure.

COMMENT

The illnesses observed in this epidemic were characteristic of *S. typhi murium* infections. They were relatively severe but of short duration, with fever, prostration, and gastro-intestinal symptoms. With few exceptions the patients were unquestionably ill or they were well. In the same institution individuals with proved Shigella infections have often had associated symptoms so mild that it was difficult to classify them as ill or well. Others have had moderate to severe or even fatal illnesses. The uniformity of the clinical manifestations in one infection and the wide variety in the other provides a marked contrast.

In this outbreak there were no typhoid-like illnesses. These are rarely observed in infections with those Salmonella strains which are pathogenic both to man and animals. Savage (*2*) mentions exceptions to this rule in outbreaks of typhoid character due to the "Dublin" and "Reading" strains of Salmonella. Blood stream and osteomyelitic infections in children due to *S. suipestifer* are becoming recognized as a clinical entity. A recent outbreak in New York State gives some evidence of a similar behavior of the "Derby" strain of Salmonella.

The opinion has been advanced by Savage (*3*) that the characteristic short and violent illness in *S. typhi murium* infection is associated with a prompt termination of the carrier state. This represents the prevailing opinion. The follow-up stool examinations in this outbreak indicate that the organisms do not always disappear promptly. One individual was known to be a carrier for 18 weeks after recovery. Perry and Tidy (*4*) made similar observations in the repeated examination of 44 cases occurring in an outbreak in an Army camp. The rate of disappearance of the organisms and the maximum duration of the carrier state (14 weeks) were very similar to those of the present outbreak.

In the study of endemic *Shigella dysenteriae* infections in the same institution, it became evident that the duration of the convalescent carrier state for Flexner infections was often long, that for Sonne commonly shorter. This period was found to be comparatively brief in the hospital epidemic due to *Shigella dysenteriae* ("Newcastle") in which nurses became infected. In the *S. typhi murium* outbreak here reported the carrier state was not protracted but was more prolonged than is usually expected. With data now available one can only speculate as to the influence of such factors as age of the host, nutritional status, specific resistance, and the character of the organism in determining the duration of this association between the host and the parasite.

Only two passive carriers of Salmonella were discovered, despite reasonably extensive cultural survey. In contrast, *Shigella dysen-*

teriae (Flexner and Sonne) were isolated frequently from individuals with no evidence of present or recent symptoms.

The epidemiological characteristics of Shigella and Salmonella infections in this institution have shown outstanding differences. The former has been observed as it spread slowly through the cottages, evidently through person to person contact, and successfully maintained itself for several months. One small explosive outbreak was encountered, evidently caused by food contamination. The Salmonella infections were introduced only in this explosive outbreak and were notable for the lack of proof of any significant amount of transfer from person to person. In each of the four cottages for the low-grade defectives, this infection was introduced, but it remained limited to those who developed symptoms at the time of the explosive outbreak. The infection totally disappeared from all cottages with the termination of the convalescent carrier states.

An opinion concerning the primary source of infection in this epidemic rests on speculation. Assuming that the Thanksgiving turkey was the vehicle, three alternatives can be considered: A human carrier or case, contamination of food by rats or mice, and *S. typhi murium* infection contracted by the turkeys before they were killed.

At the time of the Salmonella outbreak 5 of the 16 inmate kitchen helpers developed diarrhea and other symptoms in the days immediately following the Thanksgiving dinner. With one exception, all the other food handlers among inmates and employees were culturally and symptomatically negative. The exception was an inmate helper who is said to have "just cleaned" in the kitchen. She was found to be having diarrhea when rectal swabbings were taken on the food handlers 4 days after the exposure but she could not report when her symptoms began. Stool cultures on this inmate were positive for *S. typhi murium*. This individual and the 5 other ill inmate kitchen helpers ate portions of the food believed responsible for the epidemic. It would seem probable that a human, if responsible for this epidemic, would have handled some article of food in a more intimate manner than was likely in the case of this one positive person.

The negative cultural results on rats trapped near the service building do not entirely exclude rodent contamination. This method of infection has been convincingly demonstrated in an outbreak reported by Salthe and Krumweide (*5*). Jones and Wright (*6*) were actually able to find infected mouse feces in a sample of milk used by a patient. Commercial rat viruses containing Salmonella organisms have been implicated in outbreaks of *S. typhi murium* infection, but there is no history of such substances being used in this kitchen. According to Savage (*3*), rats are not so frequently

carriers of this strain as are mice. Meyer and Matsumura (*7*) found this organism in a virulent form in 3.9 percent of a series of 715 wild rats trapped in San Francisco. Nearly half of these rats were caught in the vicinity of packing houses. If the hypothesis of rodent contamination is considered, the most likely food would seem to be the ingredients of the turkey dressing, especially the bread crumbs. Covered receptacles and the general cleanliness and order in the kitchen would tend to obviate the probability of contamination by rats or mice.

Since the original flock from which the incriminated batch of turkeys came could not be determined, the existence of sick birds is only conjectural. Avian paratyphoid due to *S. typhi murium* is a recognized disease of fowl, including turkey. Jungherr and Clancy (*8*) report a small percentage of this infecting strain in lots of chicks sent to their laboratory for examination. It is probable that the incidence of this fowl disease is greater than reports indicate and that more *S. typhi murium* infection in poultry will be discovered as the laboratories become equipped to differentiate the Salmonella strains.

The infection in poultry is characterized by a generalized septicemia and hepatitis. A turkey so infected might be expected to harbour organisms in the deeper tissues. This raises one of the most perplexing problems in connection with outbreaks of bacterial food poisoning, which is to explain the survival of organisms in contaminated food after cooking. In the present instance, introduction of the infecting strain after roasting would give at the most 5 hours for the organism to multiply at room temperature before serving. This seems hardly long enough for massive contamination. Savage (*2*) cites several experiments on the temperature produced in the center of hams and other meats subjected to boiling. In most instances the temperature deep in the meats did not exceed 60° to 70° C. even after prolonged boiling. Perhaps more pertinent to this discussion is the work of Sawyer (*9*). Cooked spaghetti was the supposed vehicle of infection in a typhoid outbreak. The author inoculated a pan of spaghetti with *E. typhosus* and cooked it in a hot air sterilizer until the outside of the food was dark brown and partially charred. Even after such overcooking, abundant growth of the organism was demonstrated to within 2½ inches of the surface: The report of Dart (*10*) is good epidemiological evidence that such survival does take place in cooked food and can cause infection. In this case *S. typhi murium* infection was attributed to chicken soup and involved two related families. One bird was purchased and divided before cooking between the mother and her daughter who lived nearby. In each home the bird was boiled for 2 to 3 hours, then removed, and a portion of the soup eaten immediately thereafter. The remainder was saved without refrigeration until the following day, when it was rewarmed

and eaten. The onsets began that evening and the cases were unusually severe. The chicken was the only food shared by the two families, and one infirm individual who became ill was reported to have eaten only the soup.

The thermal death point of *S. typhi murium* is not high; 30 minutes at 60° C. will destroy this strain. Nevertheless evidence suggests that in this outbreak the organism likewise survived cooking. Slow cooling at room temperature took place. According to Savage and White (*11*), this is the optimal condition for growth of the organism in food. Turkey dressing is a good insulator against heat, and organisms deep in this dressing may well have been stimulated rather than destroyed by the temperature of the oven. The second likelihood is that a septic infection of the turkey would have lodged the Salmonellae in the deep tissues comparatively inaccessible to the penetration of heat. It may be noted that the marrow of roast fowl is often red whereas it becomes brown if the bird is boiled. The first organisms of this strain were discovered by DeNobele (*12*) in 1898 at Aertryck in Flanders. They came from the bone marrow of an infected calf, the meat from which caused an outbreak of diarrhea.

This and similar epidemics indicate the need for an experimental examination of cooking processes to ascertain the conditions under which organisms can survive in naturally infected meats or in contaminated dressings.

SUMMARY

An outbreak is reported of 238 cases of acute gastro-enteritis, with one death, in an institution for the mentally defective.

The illnesses were limited almost exclusively to the inmates of 12 cottages served by a common kitchen.

Available evidence indicated that the infection was spread during Thanksgiving dinner through turkey or its dressing.

S. typhi murium was isolated by stool culture from 86 (36.1 percent) of the cases.

A series of 195 patients were examined repeatedly to determine the duration of the convalescent carrier state. This was found to be longer than is usually expected. One patient carried the organism for 18 weeks.

Salmonella and Shigella infections are compared in certain respects.

REFERENCES

(*1*) Hardy, A. V., Frant, S., Jarcho, S. W., and Schlosser, E. G.: An outbreak of bacillary dysentery due to the "Newcastle dysentery bacillus." Pub. Health Rep., 55: 2101 (1940).

(*2*) Savage, W. G.: Food Poisoning and Food Infections. The University Press, Cambridge, 1920. A report on the investigation of an epidemic caused by *B. aertrycke*.

(3) Savage, W. G.: Some problems of Salmonella food poisoning. J. Prev. Med., **6**: 425 (1932).
(4) Perry, H. M., and Tidy, H. L.: Special Report to the Medical Research Committee (Series Number 24). His Majesty's Stationery Office, London, 1919.
(5) Salthe, O., and Krumweide, C.: Studies on the paratyphoid enteritidis group; epidemic of food infection due to paratyphoid bacillus of rodent origin. Am. J. Hyg., **4**: 23 (1924).
(6) Jones, E. R., and Wright, H. D.: *B. aertrycke* food poisoning due to contamination of food with excreta of mice. Lancet, **1**: 22 (January 4, 1936).
(7) Meyer, K. F., and Matsumura, K.: The incidence of carriers of *B. aertrycke*, *(B. pestis caviae)* and *B. enteritidis* in wild rats of San Francisco. J. Inf. Dis., **41**: 295 (1927).
(8) Jungherr, E., and Clancy, C. F.: Serologic types of Salmonella isolated from paratyphoid in chicks. J. Inf. Dis., **64**: 1 (1939).
(9) Sawyer, W. A.: 93 persons infected by a typhoid carrier at a public dinner. J. Am. Med. Assoc., **63**: 1537 (1914).
(10) Dart, G. H.: Report on sanitary conditions for the metropolitan borough of Hackney for the year 1938. Abstract in Bull. Hyg., **14**: 883 (1939).
(11) Savage, W. G., and White, P. B.: Food Poisoning, A Study of 100 Recent Outbreaks. Special Report to the Medical Research Council (Series Number 92). His Majesty's Stationery Office, London, 1925.
(12) DeNobele, J.: Du serodiagnostic dans les affections gastro-intestinales d'origine intestinale. Ann. de la Soc. de Med., **77**: 281 (1899).

RELAPSING FEVER: *ORNITHODOROS PARKERI* A VECTOR IN CALIFORNIA [1]

By Gordon E. Davis, *Senior Bacteriologist, Rocky Mountain Laboratory, United States Public Health Service*, and Harlin L. Wynns, *Chief, Bureau of Epidemiology*, and M. Dorthy Beck, *Junior Epidemiologist, California State Department of Public Health*

In the summer of 1939 approximately 125 *Ornithodoros parkeri* were collected from 3 ground squirrel burrows in Fresno and Kern Counties, Calif. (*1*). With the exception of a single specimen taken in Merced County in 1935 and only quite recently determined as *O. parkeri*, no other observations on this species in California were made until July 1940 when it was found (Wynns and Beck) in large numbers in the sandy soil of a cave in Stanislaus County where a case of relapsing fever recently had originated.[2]

Case history.—On June 19, 1940, Dr. S. E. Ghilotti, of Modesto, reported a case of relapsing fever in a male, aged 31. On May 15, while driving cattle on his ranch, J. G. took a nap in the shelter of a sandstone cliff with small caves in it, along a dry creek bed at an elevation of about 250 feet. After about an hour, he awakened to find himself "covered with ticks." A few days later he noted red spots on his arms. On May 28 he had a headache and felt feverish but did not go to bed. On June 1 he had a temperature of 100.6° F. and on June 2, 103.8° F. He had sweats, chills, pains in his back, headache,

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health, and the California State Department of Public Health, San Francisco.

[2] Since this report was written *O. parkeri* has been collected by the senior author in Butte, Yuba, Placer, and Alameda Counties. Also many other specimens have been collected in Stanislaus County (Davis and Wynns) and spirochetes again recovered.

and malaise. He then consulted his physician and was hospitalized. He was discharged on June 9 but on June 11 suffered a relapse with temperature of 105.0° F. and was again admitted to the hospital. On June 15 there was a second relapse with temperature of 105.0° F. at which time spirochetes were demonstrated in blood films. Treatment was instituted and there were no further relapses.

In 1937 a laboratory-proved case occurred in a cattleman not far from this area. The source of the infection was not determined.

Recovery of spirochetes from ticks.—Spirochetes were recovered from the *O. parkeri* collected in Fresno County in 1939 (strain No. 1) and from the 1940 collection from Stanislaus County (strain No. 2). Both strains were studied in white mice and the latter also in guinea pigs. A series of uninfected *O. parkeri*, in the first nymphal stage, were allowed to engorge on white mice infected with the two strains, and subsequently were tested by being allowed to feed on fresh white mice and guinea pigs. Ten such tests were made with strain 1 on white mice, nine with strain 2 on white mice, and eight on guinea pigs.

Tail blood of the mice and ear blood of the guinea pigs was examined daily for 21 days beginning on the fifth day following tick feeding. Daily temperatures were taken on guinea pigs. A maximum of three relapses was observed in both mice and guinea pigs. Spirochetes were present in the blood of one guinea pig on the day of release. The highest temperature recorded was 41.4° C.

DISCUSSION

Ornithodoros parkeri has been collected in eight States, viz, California, Colorado, Montana, Nevada, Oregon, Utah, Washington, and Wyoming. Spirochetes have been recovered from ticks collected in California, Montana, Nevada, Utah, and Wyoming.

The case of relapsing fever reported is the first to be definitely attributed to *O. parkeri.* All other published cases in California have originated in timbered regions at high elevations, which is the typical habitat of *O. hermsi* as observed in California, Colorado, Idaho, and Oregon. The sandy floor of a cave is also a new type of habitat for *O. parkeri*, as all other collections have been made from rodents and the burrows of rodents (*2*) and burrowing owls (*3*).

SUMMARY

The first case of relapsing fever attributable to *Ornithodoros parkeri* is reported from Stanislaus County, Calif. *O. parkeri* had been previously collected from Merced County (1935) and Kern and Fresno Counties (1939). Spirochetes which produce relapses in white mice were recovered from ticks collected in Fresno County and

spirochetes which produce relapses in white mice and guinea pigs from ticks collected in Stanislaus County.

REFERENCES

(1) Davis, Gordon E.: Ticks and relapsing fever in the United States. Pub. Health Rep., **55**: 2347–2351 (1940).
(2) Davis, Gordon E.: *Ornithodoros parkeri* Cooley: Observations on the biology of this tick. J. Parasitol., **27**: 425–433 (1941).
(3) Jellison, William L.: The burrowing owl as a host to the argasid tick, *Ornithodoros parkeri*. Pub. Health Rep., **55**: 206–208 (1940).

DISABLING MORBIDITY AMONG INDUSTRIAL WORKERS, THIRD QUARTER OF 1941 [1]

By W. M. GAFAFER, *Senior Statistician, United States Public Health Service*

The data on the frequency of sickness and nonindustrial injuries causing disability for 8 consecutive calendar days or longer during the third quarter and the first 9 months of 1940 and 1941, presented in table 1, are derived from analyses of periodic reports from industrial sick benefit associations, group insurance plans, and company relief departments. Interest in the table centers chiefly around the third quarter increase in the frequency of diarrhea and enteritis, and in the third quarter rate for pneumonia.

Diarrhea and enteritis, 1932–41.—The third quarter rates for 1941 and 1940 are 2.2 and 1.4 cases per 1,000, respectively, representing an increase of almost 60 percent in 1941. An inspection of the rates for the different quarters of each of the years 1932–41 reveals a notable variation with season, the third quarter rates consistently showing a peak. Of the 10 third quarter rates, those for 1941 and 1937 are approximately equal and well above the corresponding rates for the other 8 years.

Pneumonia.—The third quarter rates for 1941 and 1940 are approximately the same. However, the rate for pneumonia for the third quarter of 1940 was abnormally high and was the highest rate experienced for this quarter during the 10 years 1931–40.

[1] From the Division of Industrial Hygiene, National Institute of Health. The report for the second quarter appeared in PUBLIC HEALTH REPORTS, 56: 2052-2053 (October 17, 1941).

TABLE 1.—*Frequency of disabling cases of sickness and nonindustrial injuries lasting 8 consecutive calendar days or longer among* MALE *employees in various industries, by cause, the third quarter of 1941 compared with the third quarter of 1940, and the first 9 months of 1941 compared with the first 9 months of the years 1936–40, inclusive*

Cause (Numbers in parentheses are disease title numbers from the International List of Causes of Death, 1930)	Annual number of cases per 1,000 males				
	Third quarter		First 9 months		
	1941	1940	1941	1940	1936–40
Sickness and nonindustrial injuries [1]	81 4	79 2	103.4	100.6	94 9
Nonindustrial injuries (169–195)	12.8	12.0	11.7	11.6	11.3
Sickness [1]	68.6	67.2	91.7	89.0	83.6
Respiratory diseases	21.4	21.2	43 8	40 4	36.2
Influenza and grippe (33)	5.5	6 4	21.4	19.0	17.5
Bronchitis, acute and chronic (106)	3.8	3.8	5.5	5.5	4.7
Diseases of the pharynx and tonsils (115b, 115c)	4.5	3.7	5.9	5.2	5.0
Pneumonia, all forms (107–109)	1.9	1.8	4.0	3.9	2.9
Tuberculosis of the respiratory system (13)	.8	.8	.7	.7	.8
Other respiratory diseases (104, 105, 110–114)	4.9	4.7	6.3	6.1	5.3
Nonrespiratory diseases	43.7	43.5	44.8	46.4	44.8
Digestive diseases	15.6	14.4	14.9	15.0	14.2
Diseases of the stomach, except cancer (117, 118)	4.3	4.0	4 0	4.0	3 9
Diarrhea and enteritis (120)	2.2	1.4	1.4	1.3	1.3
Appendicitis (121)	4.9	5.0	5.1	5.3	4.8
Hernia (122a)	1.3	1.4	1.6	1.6	1.6
Other digestive diseases (115a, 115d, 116, 122b, 123–129)	2.9	2.6	2.8	2.8	2.8
Nondigestive diseases	28.1	29.1	29.9	31.4	30.6
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	3.2	4.2	4 0	4.6	4.2
Other genitourinary diseases (133–138)	2.7	2.5	2.4	2.7	2.4
Neuralgia, neuritis, and sciatica (87b)	1.7	1.8	1.9	2.5	2.3
Neurasthenia and the like (part of 84d)	1.0	1.1	1.0	1.1	1.0
Other diseases of the nervous system (80–85, 87, except part of 84d, and 87b)	1.1	.8	1.2	1.0	1.1
Rheumatism, acute and chronic (58, 59)	3.3	3.6	3.9	4.2	4.1
Diseases of the organs of locomotion, except diseases of the joints (156b)	2.5	2.5	2.8	2.9	2.8
Diseases of the skin (151–153)	3.6	3.3	2.8	2.9	3.0
Infectious and parasitic diseases [2] (1–12, 14–24, 26–29, 31, 32, 34–44)	2.0	2.0	2.6	2.0	2.5
All other diseases (45–57, 60–79, 88, 89, 100, 101, 103, 154, 155, 156a, 157, 162)	7.0	7.3	7.3	7.5	7.2
Ill-defined and unknown causes (200)	3.5	2.5	3.1	2.2	2.6
Average number of males covered in the record	244,023	206,614	233,937	199,786	175,936
Number of organizations	25	26	25	26	

[1] Industrial injuries, venereal diseases, and a few numerically unimportant causes of disability are not included.
[2] Except influenza, respiratory tuberculosis, and the venereal diseases.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

November 2–29, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended November 29, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—The number of reported cases of influenza rose from approximately 5,000 during the preceding 4-week period to approximately 9,600 for the 4 weeks ended November 29. Of the total number of cases, Texas reported 4,860, South Carolina, 1,166, Virginia, 658, Arizona, 420, Oklahoma, 409, Arkansas, 360, and California, 305. More than 85 percent of the cases occurred in those 7 States. Due apparently almost wholly to the high incidence in the States mentioned, the incidence for the country as a whole was more than one and one-half times that recorded for the corresponding period in 1940 and almost twice the 1936–40 median incidence for this period. Only minor excesses were reported from the East North Central, Mountain, and Pacific regions and in the North Atlantic and West North Central regions the incidence was below the average seasonal expectancy.

Meningococcus meningitis.—Five States, viz, New York (26 cases), Massachusetts (15 cases), Pennsylvania (14 cases), Illinois (11 cases), and New Jersey (7 cases), reported more than one-half of the total number of cases (145) of this disease that occurred during the current 4-week period. The excess in the country as a whole over last year and also over the 1936–40 median figure seemed to be due largely to the relatively high incidence in those States located in the North Atlantic and East North Central regions; in all other regions the incidence was below normal.

Poliomyelitis.—The number of cases (635) of poliomyelitis reported for the 4 weeks ended November 29 was about 20 percent below the incidence for the corresponding period in 1940, but it was about 15 percent above the normal seasonal level. States in the East South Central and Atlantic coast regions continued to report an unusually large number of cases, but in the West North Central, West South Central, Mountain, and Pacific regions the incidence was relatively low. With the exception of last year when the disease was still un-

usually prevalent after an outbreak in the North Central and South Atlantic regions, the current incidence is the highest for this period since 1930 when 866 cases were reported for this period.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period November 2–29, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year period	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	2,430	1,714	3,570	9,627	6,313	4,905	9,986	13,381	10,095
New England	27	17	53	6	16	23	1,296	1,494	1,016
Middle Atlantic	125	153	323	52	27	79	1,787	5,543	1,710
East North Central	314	277	574	305	247	265	1,064	4,227	972
West North Central	120	95	306	95	53	146	620	447	648
South Atlantic	779	492	948	2,121	1,537	1,537	2,096	367	641
East South Central	338	222	409	399	296	468	310	571	198
West South Central	502	293	447	5,685	1,183	1,400	591	131	173
Mountain	132	60	76	605	715	543	784	341	552
Pacific	93	105	163	359	2,239	199	1,438	260	310
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	145	88	135	635	796	543	10,289	10,005	14,007
New England	10	11	9	26	5	6	946	654	654
Middle Atlantic	47	17	29	155	48	46	1,814	1,744	2,644
East North Central	22	15	15	127	356	72	2,764	3,002	4,523
West North Central	5	7	8	39	142	59	1,105	1,223	1,807
South Atlantic	17	14	31	75	114	43	1,447	1,233	1,378
East South Central	15	16	31	139	35	35	879	828	828
West South Central	9	4	16	23	33	33	413	348	458
Mountain	4	1	8	20	27	27	341	405	485
Pacific	7	3	10	31	36	49	580	568	921
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	45	128	333	591	578	775	14,261	15,192	[3] 15,192
New England	0	0	0	12	14	17	1,287	1,424	1,342
Middle Atlantic	0	0	0	144	104	104	3,711	5,420	4,954
East North Central	11	45	59	66	55	95	4,212	2,863	2,863
West North Central	14	26	129	31	32	65	743	1,220	447
South Atlantic	6	1	1	117	108	139	1,420	1,711	1,501
East South Central	1	11	11	76	80	77	538	583	531
West South Central	3	19	22	107	105	168	495	424	379
Mountain	2	4	55	23	44	63	658	322	442
Pacific	8	22	34	15	36	49	1,107	1,625	662

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] Three-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—For the 4 weeks ended November 29 there were 2,430 cases of diphtheria reported, as compared with 1,714, 3,074, and 3,570 for the corresponding period in 1940, 1939, and 1938, respectively. The number of cases was 50 percent above the incidence in 1940, but it was only about 70 percent of the 1936–40 median figure for this period. A larger number of cases than might normally be

expected was reported from the Mountain and West South Central regions, but in all other regions the incidence was relatively low.

Measles.—The incidence of measles was slightly below the average seasonal level, approximately 9,900 cases being reported for the current period, as compared with an average of approximately 10,000 cases for the preceding 5 years. The largest increases over the seasonal expectancy were reported from the Pacific and South Atlantic regions, while minor increases were reported from each of the other regions except the West South Central; there the number of cases was slightly below the normal seasonal incidence.

Scarlet fever.—While the incidence of scarlet fever was slightly higher than in 1940, the number of cases (10,829) was only about 80 percent of the expected seasonal incidence. The New England, South Atlantic, and East South Central regions reported excesses over the 1936–40 average incidence, but in all other regions the incidence was relatively low.

Smallpox.—The number of cases (45) of smallpox reported was the lowest on record for this period. While the number of cases (6) reported in the South Atlantic region was not large, it was rather high for that region, the average incidence for the 5 preceding years being only 1 case. The North Atlantic regions remained free of the disease and all other regions reported an unusually low incidence.

Typhoid fever.—The typhoid fever incidence (591 cases) was slightly higher than it was during this period in 1940, but it was only about 75 percent of the preceding 5-year average incidence. The Middle Atlantic region reported an excess of cases, the East South Central region about the normal seasonal incidence, while all other regions reported a significantly low incidence.

Whooping cough.—The number of reported cases (14,261) of whooping cough was also relatively low. In the Atlantic Coast regions the disease was below normal, but all other regions reported excesses over the 1938–40 average incidence for this period. The excesses were small in the West North Central, South Central, and Mountain regions, but in the East North Central region the number of cases was about 1½ times the seasonal expectancy, and in the Pacific region the number of cases was almost twice the preceding 3-year average incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended November 29, based on data received from the Bureau of the Census, was 11.4 per 1,000 inhabitants (annual basis). The rate for this period in 1940 was 11.4, as was also the 1938–40 average rate for the corresponding period.

DEATHS DURING WEEK ENDED DECEMBER 6, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 6, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	8,494	8,550
Average for 3 prior years	8,628	
Total deaths, first 49 weeks of year	408,492	409,173
Deaths per 1,000 population, first 49 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	526	513
Average for 3 prior years	506	
Deaths under 1 year of age, first 49 weeks of year	25,912	24,599
Data from industrial insurance companies:		
Policies in force	64,696,204	64,817,132
Number of death claims	11,280	12,509
Death claims per 1,000 policies in force, annual rate	9.1	10.1
Death claims per 1,000 policies, first 49 weeks of year, annual rate	9.3	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occuring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 13, 1941

Summary

For the current week, the incidence of each of the 9 common communicable diseases included in the following tables, with the exception of influenza, was below the 5-year (1936–40) median expectancy. This is the first week since the week ended June 14 that the incidence of poliomyelitis has dropped below the 5-year median. For the current week only 3 States reported 5 or more cases.

The number of reported influenza cases increased from 2,742 to 2,995, slightly more than the median expectancy. For the corresponding week last year 29,864 cases were reported. Of the current total, Texas (1,423), South Carolina (376), Virginia (236), Arkansas (150) and Arizona (110) reported 2,295 cases, or about 77 percent. These were the only States reporting more than 100 cases during the current week.

Of 9 cases of smallpox, only two States reported as many as 2 cases. Typhoid fever also continues low. For the current week the incidence (105 cases) was below that for the corresponding period of any year on record. One case of Rocky Mountain spotted fever occurred in New York and 1 in South Carolina. Of 80 cases of endemic typhus fever, 36 were reported in Georgia, 17 in Alabama, and 10 in Tennessee.

The crude death rate for the current week in 88 large cities in the United States is 11.8 per 1,000 population, as compared with 11.9 last week and with 12.0 for the 3-year (1938–40) average. The cumulative rate to date, first 50 weeks of the year, is 11.7, the same as for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended December 13, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940	
NEW ENG.												
Maine	0	0	2	1	7	------	263	93	42	0	0	0
New Hampshire	2	1	0	1	------	------	4	0	1	0	0	0
Vermont	3	0	0	------	------	------	0	21	21	0	0	0
Massachusetts	7	3	5	------	------	------	143	302	302	1	2	1
Rhode Island	4	0	0	------	------	------	19	2	2	0	0	0
Connecticut	0	1	2	5	6	2	74	9	60	2	0	0
MID. ATL.												
New York [1, 3]	20	15	27	[2] 8	[2] 20	[2] 14	214	985	425	2	5	5
New Jersey	6	11	16	13	3	11	17	301	86	1	0	1
Pennsylvania [3]	8	14	32	------	------	------	723	1,170	67	3	1	3
E. NO. CEN.												
Ohio	20	8	22	13	23	23	53	139	27	0	3	3
Indiana	3	14	18	12	213	34	33	14	11	1	1	1
Illinois	41	16	33	5	18	17	40	737	34	2	1	1
Michigan [4]	6	15	15	7	9	3	86	807	305	2	3	1
Wisconsin	0	1	1	34	42	44	129	417	141	1	0	0
W. NO. CEN.												
Minnesota	2	0	1	3	1	1	66	11	41	0	0	0
Iowa	0	3	4	------	1	4	44	59	43	1	0	0
Missouri	11	13	13	3	27	44	6	23	7	1	1	1
North Dakota	1	5	2	9	28	18	60	2	2	1	0	0
South Dakota	2	0	0	------	------	------	3	5	5	0	0	0
Nebraska	2	0	2	------	3	------	4	6	6	0	0	0
Kansas	2	4	7	48	16	11	97	59	23	3	0	1
SO. ATL.												
Delaware	1	0	0	------	------	------	3	14	4	0	0	0
Maryland [4]	9	4	12	9	10	10	115	4	5	1	0	0
Dist. of Col.	0	0	5	1	2	------	2	0	1	0	0	0
Virginia	36	23	33	236	228	148	94	126	32	1	2	2
West Virginia	8	2	18	11	27	27	128	3	16	3	1	3
North Carolina [3]	44	35	63	8	11	11	412	19	270	0	1	1
South Carolina [1, 3]	5	11	11	376	359	410	34	10	11	0	0	1
Georgia [3]	22	7	14	80	214	77	57	1	1	1	0	0
Florida [3]	14	12	7	11	13	6	3	1	6	1	0	0
E. SO. CEN.												
Kentucky	5	10	17	13	31	29	13	147	10	3	3	3
Tennessee [3]	10	8	12	54	52	52	52	22	36	1	2	2
Alabama [3]	23	22	24	98	112	189	41	35	12	0	1	1
Mississippi [3]	8	13	15	------	------	------	------	------	------	2	0	1
W. SO. CEN.												
Arkansas	24	7	15	150	234	134	50	23	17	0	1	1
Louisiana [3]	4	11	14	1	321	10	4	0	2	1	1	1
Oklahoma	20	27	16	87	537	98	37	0	5	0	3	2
Texas [3]	69	40	50	1,423	671	499	236	20	30	3	1	1
MOUNTAIN												
Montana	1	3	1	12	60	18	28	4	4	0	0	0
Idaho	0	0	0	------	1,113	11	11	3	59	0	0	0
Wyoming	0	0	0	4	4	------	0	2	2	1	0	0
Colorado	14	5	7	25	42	23	244	154	7	0	0	0
New Mexico	0	0	5	4	1	------	34	51	49	1	0	0
Arizona	8	0	7	110	1,662	88	22	47	5	0	0	0
Utah [4]	0	3	1	9	8,288	33	45	2	18	0	0	0
Nevada	2	0	------	------	430	------	0	0	------	0	0	------
PACIFIC												
Washington	0	7	6	12	914	1	7	15	38	1	2	1
Oregon	3	1	1	15	978	44	68	26	17	0	1	1
California	16	12	33	84	13,133	34	607	44	71	2	0	3
Total	486	393	654	2,995	29,864	2,047	4,425	5,935	4,816	43	36	50
50 weeks	16,147	15,132	26,697	592,693	221,737	176,258	859,846	263,575	283,762	1,958	1,604	2,740

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 13, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940		Dec. 13, 1941	Dec. 14, 1940	
NEW ENG.												
Maine	0	0	0	11	12	24	0	0	0	0	0	1
New Hampshire	1	0	0	13	2	3	0	0	0	0	0	0
Vermont	0	0	0	0	18	4	0	0	0	0	1	1
Massachusetts	1	0	0	274	169	158	0	0	0	3	5	2
Rhode Island	0	0	0	12	6	11	0	0	0	0	0	0
Connecticut	4	0	0	16	45	63	0	0	0	1	0	1
MID. ATL.												
New York [1] [3]	8	1	0	324	300	398	0	0	0	[3] 7	5	6
New Jersey	2	0	1	124	122	94	0	0	0	0	3	3
Pennsylvania [3]	3	1	1	226	247	346	0	0	0	7	6	8
E. NO. CEN.												
Ohio	2	12	1	214	152	274	0	1	1	7	0	8
Indiana	3	1	0	87	108	152	0	1	4	4	3	3
Illinois	5	8	1	[5] 207	355	355	[5] 0	1	2	[5] 3	1	1
Michigan [4]	0	2	2	203	185	303	1	6	2	1	4	4
Wisconsin	0	13	0	147	149	160	1	6	6	1	1	0
W. NO. CEN.												
Minnesota	2	2	2	92	76	129	0	29	21	0	1	0
Iowa	0	3	1	55	75	94	2	1	11	1	1	1
Missouri	1	3	1	59	94	116	0	1	1	1	6	5
North Dakota	1	0	0	11	25	29	0	2	5	0	0	0
South Dakota	0	0	0	33	14	31	0	0	3	0	0	0
Nebraska	0	1	0	27	36	31	0	0	1	0	1	1
Kansas	1	2	1	70	65	144	0	1	1	1	1	0
SO. ATL.												
Delaware	1	0	0	23	11	12	0	0	0	0	0	0
Maryland [4]	0	0	0	47	57	57	0	0	0	13	3	3
Dist. of Col.	0	0	0	9	9	10	0	0	0	2	0	1
Virginia	1	3	0	65	67	55	0	0	0	11	5	5
West Virginia	0	3	1	48	52	66	0	0	0	1	5	2
North Carolina [3]	4	3	0	78	78	65	0	0	0	4	9	4
South Carolina [1] [3]	1	2	0	12	13	13	0	0	0	1	1	1
Georgia [3]	0	1	1	14	42	42	0	0	0	0	4	6
Florida [3]	0	3	0	7	4	5	0	1	0	2	6	3
E. SO. CEN.												
Kentucky	1	2	1	77	84	81	1	0	0	1	6	3
Tennessee [3]	5	0	0	60	100	60	0	0	0	0	4	1
Alabama [3]	1	0	1	41	21	21	0	0	0	1	1	1
Mississippi [3]	1	2	1	16	11	11	0	0	0	1	0	1
W. SO. CEN.												
Arkansas	1	0	1	5	16	20	0	2	1	5	1	4
Louisiana [3]	0	1	1	7	5	15	1	0	0	3	7	7
Oklahoma	1	1	1	27	27	27	2	4	4	3	8	7
Texas [3]	1	1	1	54	63	90	0	2	2	4	6	14
MOUNTAIN												
Montana	0	0	0	24	16	31	0	1	6	0	1	1
Idaho	0	0	0	7	15	13	0	1	2	1	1	1
Wyoming	0	1	0	5	8	8	0	0	1	1	1	0
Colorado	0	1	1	26	31	31	0	0	5	1	3	3
New Mexico	0	1	1	8	10	15	0	0	0	1	2	3
Arizona	1	0	0	9	5	8	1	0	0	1	2	0
Utah [4]	0	1	0	18	7	26	0	0	0	0	1	0
Nevada	0	0	------	10	1	------	0	0	------	0	0	------
PACIFIC												
Washington	3	6	0	37	28	41	0	0	2	0	0	0
Oregon	0	1	1	5	19	34	0	0	7	1	0	1
California	2	3	5	131	75	223	0	2	2	10	3	8
Total	58	85	67	3,100	3,130	4,234	9	62	174	105	119	128
50 weeks	8,962	9,685	7,203	[5] 121,875	149,649	179,436	[5] 1,332	2,354	9,346	[5] 8,344	9,405	14,020

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 13, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended Dec. 13, 1941	Whooping cough, Week ended Dec. 14, 1940
NEW ENG.		
Maine	45	27
New Hampshire	14	12
Vermont	8	7
Massachusetts	199	287
Rhode Island	34	2
Connecticut	44	127
MID. ATL.		
New York [1] [3]	640	403
New Jersey	261	174
Pennsylvania [3]	216	597
E. NO. CEN.		
Ohio	223	305
Indiana	19	13
Illinois	225	176
Michigan [4]	352	353
Wisconsin	273	118
W. NO. CEN.		
Minnesota	27	110
Iowa	16	10
Missouri	20	146
North Dakota	13	11
South Dakota	2	6
Nebraska	3	28
Kansas	33	124
SO. ATL.		
Delaware	2	17
Maryland	53	80
Dist. of Col.	10	10
Virginia	35	82
West Virginia	35	45
North Carolina [3]	118	268
SO. ATL.—continued		
South Carolina [1] [3]	28	38
Georgia [3]	13	9
Florida [3]	10	12
E. SO. CEN.		
Kentucky	60	104
Tennessee [3]	12	79
Alabama [3]	6	50
Mississippi [3]	----------	----------
W. SO. CEN.		
Arkansas	2	21
Louisiana [3]	1	4
Oklahoma	4	61
Texas	69	202
MOUNTAIN		
Montana	59	14
Idaho	3	4
Wyoming	15	0
Colorado	38	40
New Mexico	16	23
Arizona	60	11
Utah [4]	23	19
Nevada	5	1
PACIFIC		
Washington	103	73
Oregon	35	16
California	151	288
Total	3,633	4,612
50 weeks	202,754	164,231

[1] Rocky Mountain spotted fever, week ended Dec. 13, 1941, 2 cases, as follows: New York, 1; South Carolina, 1.

[2] New York City only.

[3] Typhus fever, week ended Dec. 13, 1941, 80 cases as follows: New York, 1; Pennsylvania, 1; North Carolina, 1; South Carolina, 1; Georgia, 36; Florida, 4; Tennessee, 10; Alabama, 17; Mississippi, 2; Louisiana, 3; Texas, 4.

[4] Period ended earlier than Saturday.

[5] Instead of the figures published, later information shows, for the week ended November 8, in Illinois, 155 cases of scarlet fever, 2 cases of typhoid fever, and 1 case of smallpox; for the week ended November 29, in New York, 16 cases of typhoid fever. See Public Health Reports of November 14, p. 2223, and December 5, p. 2352.

WEEKLY REPORTS FROM CITIES

City reports for week ended November 29, 1941

This table lists the reports from 131 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	1	2	5	0	0	0	5	25
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	0	25
Manchester	0	------	0	3	0	11	0	0	0	0	14
Nashua	0	------	0	3	0	0	0	0	0	14	6
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	1	23	11	30	0	10	1	41	203
Fall River	1	------	0	5	0	18	0	0	0	1	28
Springfield	0	------	0	8	0	9	0	1	0	21	29
Worcester	0	------	0	1	4	11	0	1	0	18	47
Rhode Island:											
Pawtucket	1	------	------	18	------	1	0	------	0	4	------
Providence	0	------	0	2	1	5	0	2	0	50	62
Connecticut:											
Bridgeport	1	------	0	2	0	7	0	0	0	0	33
Hartford	0	------	0	2	5	2	0	0	0	3	37
New York:											
Buffalo	0	------	0	0	6	15	0	8	0	16	133
New York	12	4	2	25	48	70	0	54	8	309	1,431
Rochester	0	------	0	0	1	2	0	2	0	10	57
Syracuse	0	------	0	0	4	3	0	0	0	19	43
New Jersey:											
Camden	0	1	0	0	5	8	0	1	0	4	39
Newark	0	4	0	3	4	13	0	6	0	38	117
Trenton	0	2	0	0	0	9	0	5	0	10	41
Pennsylvania:											
Philadelphia	2	1	1	5	18	52	0	19	0	42	461
Pittsburgh	1	------	0	4	13	6	0	5	0	19	133
Reading	0	------	0	0	0	0	0	0	0	1	22
Scranton	0	------	------	1	------	1	0	------	0	1	------
Ohio:											
Cincinnati	0	------	0	1	3	15	0	8	0	8	138
Cleveland	1	11	0	2	9	39	0	15	1	33	188
Columbus	1	------	0	3	3	7	0	0	0	13	80
Toledo	0	1	0	0	1	4	0	5	0	19	83
Indiana:											
Anderson	0	------	0	0	0	1	0	0	0	0	6
Fort Wayne	0	------	0	1	2	0	0	0	0	0	20
Indianapolis	5	------	2	3	7	27	0	3	0	12	121
South Bend	0	------	0	0	1	2	0	0	0	0	20
Terre Haute	0	------	0	0	2	1	0	0	0	0	23
Illinois:											
Alton	0	------	0	0	1	3	0	1	0	1	15
Chicago	15	2	1	6	31	64	0	87	1	146	682
Elgin	1	1	0	1	1	1	0	0	1	15	4
Moline	0	------	0	0	0	0	0	0	0	2	12
Springfield	0	------	0	0	1	3	0	0	0	0	28
Michigan:											
Detroit	3	------	1	8	5	85	0	23	1	51	274
Flint	0	------	0	0	2	3	0	1	0	5	26
Grand Rapids	0	------	0	1	1	0	0	0	1	8	33
Wisconsin:											
Madison	0	------	0	4	0	1	0	0	0	3	24
Milwaukee	0	------	0	3	5	22	0	0	0	117	90
Racine	0	------	0	0	0	3	1	0	0	12	17
Superior	0	------	0	0	0	0	0	0	0	12	9
Minnesota:											
Duluth	0	------	0	0	0	2	0	0	0	4	27
Minneapolis	1	------	0	0	4	11	0	1	0	13	95
Iowa:											
Cedar Rapids	0	------	------	0	------	2	0	------	0	1	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	2	------	0	1	2	2	0	0	0	0	43
Sioux City	0	------	------	0	------	0	0	------	2	2	------
Waterloo	0	------	------	1	------	2	0	------	0	2	------
Missouri:											
Kansas City	0	------	1	1	6	13	0	6	0	8	99
St. Joseph	0	------	0	1	6	1	0	1	0	1	25
St. Louis	4	1	0	2	13	15	0	3	0	12	209

City reports for week ended November 29, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	0	6
Grand Forks	0	------	------	0	------	0	0	------	0	2	------
Minot	0	------	0	33	0	1	0	0	0	0	8
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	4	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	10
Nebraska:											
Lincoln	0	------	------	0	------	1	0	------	0	1	------
Omaha	0	------	0	1	2	5	0	1	0	0	43
Kansas:											
Lawrence	0	------	0	0	0	0	0	1	0	0	6
Topeka	0	------	0	1	0	3	0	0	0	1	20
Wichita	0	------	0	0	1	5	0	1	1	1	28
Delaware:											
Wilmington	0	------	0	0	2	8	0	0	0	0	30
Maryland:											
Baltimore	4	3	0	71	22	31	0	7	0	33	225
Cumberland	0	------	0	0	2	0	0	0	0	0	11
Frederick	0	------	0	0	0	0	0	0	0	0	5
Dist. of Col.:											
Washington	1	1	0	4	13	18	0	10	1	32	195
Virginia:											
Lynchburg	1	------	0	0	0	0	0	0	0	0	6
Richmond	7	------	1	0	3	5	0	0	0	0	48
Roanoke	0	------	0	0	1	1	0	1	0	4	23
West Virginia:											
Charleston	0	------	0	1	2	6	0	0	0	2	15
Huntington	1	------	------	0	------	3	0	------	0	0	------
Wheeling	0	------	0	8	1	1	0	0	0	2	18
North Carolina:											
Gastonia	1	------	------	0	------	1	0	------	0	0	------
Raleigh	0	------	0	0	0	1	0	0	0	4	5
Wilmington	1	------	0	7	2	2	0	0	0	2	11
Winston-Salem	1	------	0	223	1	1	0	2	0	4	18
South Carolina:											
Charleston	0	29	0	0	2	0	0	1	1	0	16
Florence	0	------	0	0	0	3	0	0	0	0	5
Greenville	0	------	0	0	0	1	0	0	0	0	18
Georgia:											
Atlanta	1	3	1	0	4	15	0	5	1	2	91
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	0	4	0	16	2	1	0	1	0	0	29
Florida:											
Miami	0	1	1	0	1	1	0	1	0	1	37
St. Petersburg	2	------	0	0	1	1	0	0	0	2	24
Tampa	0	1	0	0	2	0	0	0	0	0	26
Kentucky:											
Ashland	1	------	0	0	1	0	0	1	0	6	8
Covington	0	------	0	0	1	3	0	1	0	0	10
Lexington	0	------	0	1	1	1	0	2	0	2	15
Tennessee:											
Knoxville	0	------	0	0	0	2	0	1	0	3	15
Memphis	2	4	1	3	1	4	0	2	1	16	61
Nashville	0	------	0	0	2	5	0	1	0	3	47
Alabama:											
Birmingham	2	2	0	0	2	10	0	2	0	0	73
Mobile	0	2	0	7	1	1	0	1	0	0	22
Montgomery	1	5	------	0	------	2	0	------	0	0	------
Arkansas:											
Fort Smith	1	------	------	0	------	0	0	------	0	0	------
Little Rock	0	7	0	0	0	2	0	1	0	1	31
Louisiana:											
Lake Charles	0	------	0	0	2	0	0	0	0	0	7
New Orleans	2	6	2	1	13	5	0	12	0	2	144
Shreveport	2	------	0	1	5	0	0	5	2	0	45
Oklahoma:											
Oklahoma City	0	8	0	0	4	2	0	0	0	0	38
Tulsa	5	------	0	56	1	5	0	0	0	0	9
Texas:											
Dallas	9	------	0	40	6	7	0	1	0	6	60
Fort Worth	0	------	0	1	0	2	0	1	0	3	50
Galveston	0	------	0	0	2	2	0	0	0	0	10
Houston	2	------	0	0	10	4	0	5	1	1	98
San Antonio	0	21	3	1	3	1	0	8	1	3	58

City reports for week ended November 29, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Montana:											
Billings	0	------	0	0	1	1	0	0	0	0	7
Great Falls	0	------	0	5	1	0	0	0	0	0	11
Helena	0	------	0	0	0	0	0	0	0	0	2
Missoula	0	------	0	0	0	0	0	0	0	0	5
Idaho:											
Boise	0	------	0	6	0	3	0	0	0	4	2
Colorado:											
Colorado Springs	0	------	0	1	1	2	0	0	0	3	7
Denver	7	27	1	12	5	10	0	0	0	20	84
Pueblo	1	------	0	68	0	0	0	0	0	0	8
New Mexico:											
Albuquerque	1	------	0	2	3	1	0	3	0	3	12
Arizona:											
Phoenix	1	44	-------	0	-------	0	0	-------	0	0	-------
Utah:											
Salt Lake City	0	------	0	2	3	1	0	1	0	4	36
Washington:											
Seattle	0	------	0	0	5	2	0	5	0	18	116
Spokane	0	------	0	0	1	4	0	1	0	2	25
Tacoma	0	------	0	0	0	2	0	0	0	5	32
Oregon:											
Portland	1	3	0	1	2	2	0	1	0	7	80
Salem	0	------	-------	0	-------	0	0	-------	0	0	-------
California:											
Los Angeles	6	20	1	17	6	18	0	5	0	14	376
Sacramento	0	------	0	7	4	5	0	2	0	3	35
San Francisco	0	3	0	3	5	4	0	5	0	7	183

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				District of Columbia:			
Boston	1	0	1	Washington	1	0	1
New York:				Florida:			
Buffalo	1	0	0	Tampa	0	0	1
New York	10	1	2	Tennessee:			
Syracuse	0	1	2	Nashville	0	0	2
New Jersey:				Texas:			
Newark	1	0	1	Dallas	0	0	1
Pennsylvania:				Colorado:			
Philadelphia	1	0	2	Denver	1	0	0
Pittsburgh	2	0	0	Arizona:			
Ohio:				Phoenix	0	0	1
Cincinnati	0	0	1	Oregon:			
Illinois:				Portland	1	0	0
Chicago	2	0	4	California:			
Maryland:				Los Angeles	0	0	1
Baltimore	1	0	0	San Francisco	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Newark, 2; Philadelphia, 1; Denver, 1 Deaths: New York, 1; Minneapolis, 1.

Pellagra.—Cases: Charleston, S. C., 1; Savannah, 2.

Typhus fever.—Cases: New York, 1; Philadelphia, 1; Raleigh, 1; Atlanta, 2; Savannah, 1; Miami, 2; Nashville, 3; Mobile. 1; New Orleans, 2; Houston, 1.

Rates (annual basis) per 100,000 population for a group of 87 selected cities (population 1940, 33,432,006)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
		Cases	Deaths							
Week ended Nov. 29, 1941	14.97	24.80	2.96	95.61	56.62	119.63	0.16	46.48	3.43	196.21
Average for week, 1936–40	23.65	73.94	6.15	159.70	79.46	148.98	1.58	50.92	4.41	180.83

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS IN SHASTA AND SISKIYOU COUNTIES, CALIF.

Under date of December 2, 1941, Dr. Bertram P. Brown, Director of Public Health of California, reported plague infection proved, by animal inoculation and cultures, in fleas from ground squirrels, *C. douglasii*, as follows: In a pool of 31 fleas from 2 ground squirrels, and in another pool of 18 fleas from 1 ground squirrel, submitted to the laboratory on October 24 from locations 26 and 28 miles north of Redding, Shasta County, Calif.; in a pool of 27 fleas from 2 ground squirrels submitted on October 21 from property 3½ miles north and ½ mile west of Mount Shasta City, and in a pool of 91 fleas from 4 ground squirrels submitted on October 22 from a ranch about 2 miles northeast of Edgewood, both locations in Siskiyou County, Calif.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague (rodent).—A rat found on November 17, 1941, at Paauhau, Hamakua District, Island of Hawaii, T. H., has been proved positive for plague.

FOREIGN REPORTS

BERMUDA

Dengue.—Cases of dengue have been reported in Bermuda as follows: Weeks ended—Nov. 1, 255 cases; Nov. 8, 129; Nov. 15, 99; Nov. 22, 247; Nov. 29, 194.[1]

BRITISH EAST AFRICA

Tanganyika Territory—Cerebrospinal meningitis.—During the period June 29 to September 27, 1941, a total of 815 cases of cerebrospinal meningitis, with 136 deaths, was reported in Tanganyika Territory, British East Africa. From June 29 to July 26, 1941, 52 cases with 9 deaths were reported. The number of reported cases of cerebrospinal meningitis and deaths from the disease, by weeks from July 27 to September 27, is as follows:

Week ended—	Cases	Deaths	Week ended—	Cases	Deaths
Aug. 2	14	2	Sept. 6	80	15
9	79	16	13	93	11
16	94	14	20	102	23
23	57	12	27	167	19
30	77	15	Total, July 27–Sept. 27	763	127

CANADA

Provinces—Communicable diseases—Week ended November 15, 1941.—During the week ended November 15, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	4	2		4	1	1	1	3	17
Chickenpox		33		237	457	[1] 66	69	16	107	985
Diphtheria		30	8	33	4	10	1		1	82
Dysentery				3	7					10
Influenza		16			2	1	2		13	34
Lethargic encephalitis						1				1
Measles				309	29	28	8	6	7	477
Mumps		6		357	142	42	28	6	76	657
Pneumonia	2	2			3		2		12	21
Poliomyelitis			8	2		1			1	12
Scarlet fever	2	20	31	71	227	16	82	23	84	456
Tuberculosis	3	7	8	79	57	2	25			181
Typhoid and paratyphoid fever				11			1			12
Whooping cough		15	1	562	132	1	1	21	50	783

[1] Includes 1 nonresident.

[1] See also PUBLIC HEALTH REPORTS of October 30, 1941, page 2137.

CUBA

Provinces—Notifiable diseases—4 weeks ended November 8, 1941.—During the 4 weeks ended November 8, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		4	15		8	28
Chickenpox		1				4	5
Diphtheria		11	2	1	5	4	23
Hookworm disease		19		3			22
Leprosy		8	1		1		10
Malaria	289	33		32	3	76	433
Measles		17	29				46
Scarlet fever		2	1				3
Trachoma		1		2			3
Tuberculosis	16	57	22	61	17	49	222
Typhoid fever	18	59	19	24	14	35	169
Whooping cough	1						1
Yaws						556	556

[1] Includes the city of Habana.

JAMAICA

Communicable diseases—4 weeks ended November 22, 1941.—During the 4 weeks ended November 22, 1941, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		1	Leprosy		1
Chickenpox	2	8	Puerperal sepsis	1	2
Diphtheria	3	6	Tuberculosis	34	64
Dysentery	7	3	Typhoid fever	13	64
Erysipelas		1			

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-named diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Afghanistan—Southern Province.—During the week ended December 6, 1941, cholera was reported present in the Southern Province, Afghanistan.

Plague

Peru—Lima Department.—During the month of October 1941, plague was reported in Lima Department, Peru, as follows: Huaura, 4 cases, 2 deaths; Sayan, 1 case, 1 death.

Yellow Fever

Brazil—Para State—Irituia.—On October 8, 1941, 1 death from yellow fever was reported in Irituia, Para State, Brazil.

Ivory Coast—Abengourou.—On November 30, 1941, 1 suspected case of yellow fever was reported in Abengourou, Ivory Coast.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year

Public Health Reports

VOLUME 56 **DECEMBER 26, 1941** NUMBER 52

IN THIS ISSUE

CONTENTS

Public Health Reports

Vol. 56 • DECEMBER 26, 1941 • *No. 52*

STUDIES OF SEWAGE PURIFICATION [1]

XV. EFFECTIVE BACTERIA IN PURIFICATION BY TRICKLING FILTERS

By C. T. Butterfield, *Principal Bacteriologist*, and Elsie Wattie, *Assistant Bacteriologist; United States Public Health Service*

In studies of the activated sludge process of sewage purification, it was shown (*1*) that the predominant bacteria in activated sludge belonged to a group represented by zoogleal formations. Subsequently it was demonstrated (*2*) that these bacteria are the active agents in activated sludge, being capable in pure culture of producing

[1] From the Division of Public Health Methods, National Institute of Health. Preceding papers in this series are:

Theriault, E. J., and McNamee, P. D.: Studies of sewage purification. I. Apparatus for the determination of dissolved oxygen in sludge-sewage mixtures. Pub. Health Rep., 50: 480 (1935). Reprint 1680.

Butterfield, C. T.: Studies of sewage purification. II. A zooglea-forming bacterium isolated from activated sludge. Pub. Health Rep., 50: 671 (1935). Reprint 1686.

Theriault, E. J.: Studies of sewage purification. III. The clarification of sewage. A review. Sewage Works J., 7: 377 (1935). Pub. Health Rep., 50: 1581 (1935). Reprint 1715.

Smith, Russell S., and Purdy, W. C.: Studies of sewage purification. IV. The use of chlorine for the correction of sludge bulking in the activated sludge process. Sewage Works J., 8: 223-230 (1936). Pub. Health Rep., 51: 617 (1936). Reprint 1746.

McNamee, P. D.: Studies of sewage purification. V. Oxidation of sewage by activated sludge. Sewage Works J., 8: 562 (1936). Pub. Health Rep., 51: 1034 (1936). Reprint 1774.

Butterfield, C. T., Ruchhoft, C. C., and McNamee, P. D.: Studies of sewage purification. VI. Biochemical oxidation by sludges developed by pure cultures of bacteria isolated from activated sludge. Sewage Works J., 9: 173 (1937). Pub. Health Rep., 52: 387 (1937). Reprint 1812.

Ruchhoft, C. C., McNamee, P. D., and Butterfield, C. T.: Studies of sewage purification. VII. Biochemical oxidation by activated sludge. Sewage Works J., 10: 661 (1938). Pub. Health Rep., 53: 1690-1718 (1938). Reprint 1987.

Butterfield, C. T., and Wattie, Elsie: Studies of sewage purification. VIII. Observations on the effect of variations in the initial numbers of bacteria and of the dispersion of sludge flocs on the course of oxidation of organic material by bacteria in pure culture. Pub. Health Rep., 53: 1912 (1938). Reprint 1999.

Ruchhoft, C. C., Butterfield, C. T., McNamee, P. D., and Wattie, Elsie: Studies of sewage purification. IX. Total purification, oxidation, adsorption, and synthesis of nutrient substrates by activated sludge. Sewage Works J., 11: 195 (1939). Pub. Health Rep., 54: 468 (1939). Reprint 2050.

Ruchhoft, C. C., and Smith, R. S.: Studies of sewage purification. X. Changes in characteristics of activated sludge induced by variations in applied load. Sewage Works J., 11: 409 (1939). Pub. Health Rep., 54: 924 (1939). Reprint 2074.

Ruchhoft, C. C., Kachmar, J. F., and Moore, W. A.: Studies of sewage purification. XI. The removal of glucose from substrates by activated sludge. Sewage Works J., 12: 27 (1940). Pub. Health Rep., 55: 393 (1940). Reprint 2142.

Ruchhoft, C. C., Kachmar, J. F., and Placak, O. R.: Studies of sewage purification. XII. Metabolism of glucose by activated sludge. Pub. Health Rep., 55: 582 (1940). Reprint 2149.

Lackey, James B., and Wattie, Elsie: Studies of sewage purification. XIII. The biology of *Sphaerotilus natans* kutzing in relation to bulking of activated sludge. Pub. Health Rep., 55:975 (1940). Reprint 2166.

Ruchhoft, C. C., and Kachmar, John F.: Studies of sewage purification. XIV. The role of *Sphaerotilus natans* in activated sludge bulking. Pub. Health Rep., 56: 1727 (1941). Reprint 2309.

not only activated sludge but also possessing the powers of oxidation and purification inherent in natural activated sludge.

In the trickling filter process of sewage purification, also biological in nature, the fundamental set-up of the process would suggest that the active agents might be the same organisms as those of activated sludge. That is, with both processes the success of the purification depends on the presence of three essential elements, (1) bacterial masses or flocs, (2) food supply for these bacteria, i. e., polluting material, and (3) a continuous source of oxygen. The process is also dependent upon a physical means of keeping these three elements dispersed and continuously in contact with each other. In the activated sludge process the contact and mixing is brought about by an agitation of the sludge-sewage mix with compressed air which also provides a continuous source of oxygen. In the trickling filter the sludge mass is held dispersed on a framework of stones, or other material, while the sewage trickles over the surface of the sludge. The interstices of this framework provide an ample air reservoir and the circulation of this contained oxygen is aided, in part, by the flow of liquid through the system. With intermittent flow, time is provided for the sludge to utilize the adsorbed substances. Moreover, the successful perpetuation of both processes is dependent on the frequent or continuous removal of excess, and frequently detrimental, byproducts. Soluble fractions of such byproducts are removed with the effluent in both processes. Suspended matter is removed continuously in the activated sludge process by the withdrawal of excess sludge, while in the trickling filter such withdrawals are accomplished by a continuous but moderate unloading and by a periodic sloughing off of the accumulations on the filter stones. With both processes the removal of excess material is probably aided by successive growths of various biological forms. The latter factor is probably more significant in the trickling filter where such biological growths are more varied and more abundant.

While the two processes are fundamentally similar, it does not necessarily follow that the active bacterial agents are the same or even belong to the same group or genus. Consequently, it appeared desirable to study the bacterial flora of trickling filters, to isolate the predominant bacteria in a few instances, to determine the ability of these organisms in pure culture to carry on the trickling filter process, and if such bacteria appeared to be similar to those obtained from activated sludge, to make a comparative pure culture study of the two types employing both activated sludge and trickling filter set-ups.

OPERATION OF EXPERIMENTAL UNIT

An experimental trickling filter, 30 inches square and 6 feet deep,

served as an immediate source of material for this study. The filter was fed with settled natural sewage in standard fashion (in intermittent cycles), usually at a rate of 3 million gallons per acre per day continuously throughout the 24-hour period. The sewage employed was from Third Street sewer, Cincinnati, Ohio, which carries principally a domestic sewage from a residential section.

From the start of the flow of sewage through this filter frequent macroscopic and microscopic examinations (the latter of both wet and dry stained preparations) were made of composite samples of material scraped from the stones of the filter. Results of these examinations indicated a very marked similarity between the growths on the stones of the trickling filter and the growths of activated sludge previously studied and reported (*1*). This agreement was particularly apparent in the bacterial section of the biological elements involved. With regard to biological forms, other than bacteria, the presence of flies and fly larvae (which are never found in activated sludge) and of certain varieties of worms (only rarely observed in activated sludge) in the growths of the trickling filter has been noted. These observations have been confirmed repeatedly by the results of a study of the material on stones obtained from two municipal trickling filter plants.

PURE CULTURE ISOLATIONS

As soon as this trickling filter had developed a normal purification rate, as measured by the reduction in the biochemical oxygen demand (B. O. D.) of the sewage passing through the filter, an intensive bacteriological study was instituted of the growths which had developed on the stones. This study involved the isolation, in pure culture, of the predominant bacterium present in the growths and in some instances an attempt to determine the relative number of such bacteria per ml. of growth. In making these observations, two methods were followed. With both methods a number of stones, with their adherent growth, were selected at random from various sections of the filter. After a gentle preliminary washing with sterile dilution water to remove extraneous and loosely attached material and organisms, the adherent growths were carefully scraped from the stones with sterile instruments and the removed material accumulated in a sterile petri dish. From this point one of the following two methods was applied.

Method No. 1.—The accumulated growth was mixed thoroughly, and a one-tenth ml. portion was withdrawn and examined carefully under low power magnification. Typical massed bacterial formations, which appeared to represent the predominant type of bacteria in the mixture, were selected, picked with sterile capillary pipettes and carefully washed by passing them, with appropriate agitation, through a series of sterile dilution waters. When these massed formations of

bacteria and adherent material, the bacteria in the masses were dispersed by pressure between two sterile glass surfaces. Simultaneously, sterile dilution water was added and a fairly thorough separation of the clumped bacteria was obtained. The organisms, thus dispersed, were planted in serial dilution in tubes of broth and synthetic sewage. The tubes were incubated at 20° C. and examinations were made at 24-hour intervals for 96 hours. Usually growth occurred in all dilutions up to and including the 0.00001 dilution and all growths above the 0.01 dilution appeared to be pure and of the same type of organism. Isolations made from the highest dilutions were subjected to additional purification and held for further study.

Method No. 2.[2]—The accumulated growth, referred to above, was mixed thoroughly and a 1 ml. or larger portion was removed and placed in a 1-ounce sterile ground-glass stoppered bottle with glass beads. Sterile dilution water was then added to make 10 ml. and the mixture was shaken at full speed in the shaking machine for 10 minutes. Immediately afterward the now finely divided mixture was diluted further and planted in serial dilution in tubes of broth or synthetic sewage. Tubes thus inoculated were incubated at 20° C. for 96 hours. Growth usually occurred in all dilutions up to the 0.00001 or 0.000001 dilution and judging from microscopic observations all growths from tubes above the 0.01 to the 0.001 dilution contained pure cultures. To insure the purity of these cultures transfers were made from the highest dilutions showing growth. After these transfers had been incubated for 6 to 8 hours (i. e., after some growth had occurred but before sufficient growth had taken place to produce any crowding or clumping of cells) they were planted out in serial dilution on dilute nutrient agar plates. (While these organisms do not grow well on standard nutrient agar they will produce colonies of about 1.0 mm. diameter after incubation for 4 to 6 days at 20° C. on dilute (1–3) nutrient agar.) Selecting plates which contained not more than 20 to 30 colonies per plate, transfers were made from typical colonies. This process of short-time incubation in liquid media followed by planting on solid media was repeated two or three times for each isolation. Colony appearance, microscopic examination of stained smears, and additional chemical tests have

[2] Method No. 1 outlined above was the procedure followed in the original work with activated sludge as reported in reference *1*. Shortly after this article appeared a fair and just criticism was voiced to the effect that this method of selection of the portion of sludge for examination introduced a personal equation in the selection which might materially affect the result. That is, a mass might be selected which did not represent the predominant organism in the mixture. However, this presumption does not appear probable when it is considered that the worker responsible for the selection had been making daily intensive microscopical study of the material over a period of several months. A study of means of dispersing bacteria massed in the gross mixture, which may be reported later, resulted in the development of method No. 2. It should be noted here that the work reported in reference *1* has since been repeated employing method No. 2 without any variation in the type of organism isolated as the predominant bacterium in activated sludge. Method No. 2 is not presented as a perfect procedure, as it has many inherent errors. However, it does avoid some of the errors of procedure No. 1, and the fact that the same type of bacterium is obtained by both methods goes far toward establishing the results presented.

indicated the purity of the cultures thus obtained. Such cultures were held for further study.

Four such cultures of the presumably predominant bacteria in the growths on the stones of the experimental trickling filter have been isolated and subjected to study. In addition, cultures have been isolated from two municipal sewage trickling filter plants.

These four isolations from the experimental filter were made from samples collected at various periods during the year as follows: (1) One in March when temperatures were near freezing and the filter was overloaded; (2) two in June when the temperature was about the average for the year and the filter was being fed at a normal rate of about 3 million gallons per acre per day; and (3) one in August when the highest temperatures of the year prevailed and the flow of sewage to the filter was at a normal rate. The average purification efficiency of the filter for each month in which these cultures were isolated, expressed in terms of the percentage of the 5-day biochemical oxygen demand removed, was 50.4 percent for the first samples, 92.8 percent for the second, and 93.9 percent for the third.

The results obtained while these cultures were being isolated show that these bacteria are present in the filter growth at least to the extent of 300,000,000 per ml. of growth. This figure is cited as representing a minimum number, for it is not reasonable to presume that an accurate enumeration was obtained. As it was not possible to make direct counts of the bacteria present in such a mass, recourse had to be made to procedures which would disperse the bacteria so that plate counts or most probable number estimations based on growth in serial dilutions could be made. To make an accurate enumeration by such a procedure, two assumptions must be made: (1) That all clumps or masses of bacteria were completely broken up, and (2) that no cells were killed, or injured sufficiently to prevent growth, by the dispersion procedure. While the latter assumption cannot be tested, microscopic examination of the treated sample showed definitely that the dispersion of the massed organisms was not complete. Consequently, it is known that the 300 million count given is a low figure and does not represent the maximum number of this type of bacterial cells. In this connection, it is noted that pure culture trickling filter growths free from detritus or any other material yielded a count of 880,000,000 bacteria per ml. of accumulated growth. The accuracy of this count is subject to the same two assumptions.

CONSTRUCTION AND OPERATION OF PURE CULTURE FILTER

The development of apparatus to explore the ability of these bacteria, under pure culture conditions, to reproduce the trickling filter process of sewage purification required considerable time and was accom-

panied by numerous failures before a fair measure of success was attained. The apparatus employed in the studies here reported is shown diagrammatically in figure 1. As the assembled set-up was

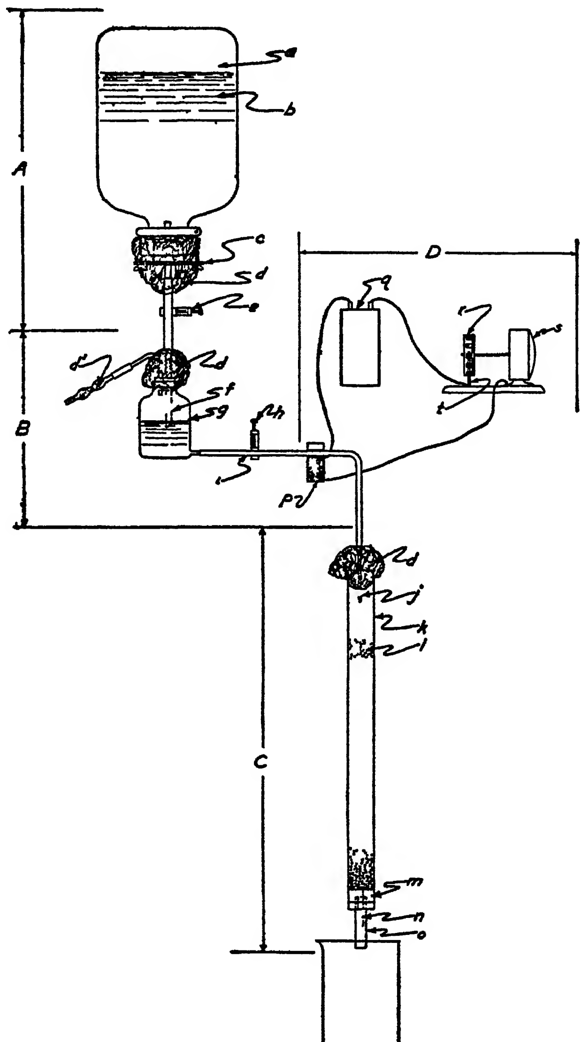


FIGURE 1.—Sketch of pure culture trickling filter set-up.

too large to be sterilized intact, provision was made for a division into sections for sterilization. These sections, unit A, stock supply of sterile synthetic sewage; unit B, equalizing reservoir for maintaining approximately a constant pressure on the feed line; unit C, trickling filter with provision for inflow and outflow of liquid, and unit D, control device for intermittent flow, are indicated in the figure. Units A, B, and C were sterilized by autoclaving, with their tubes for sub-

sequent interconnections adequately protected by cotton packing from contamination. Unit D, which did not come in direct contact with the filter or feed material, was not subjected to sterilization.

As far as is known this is the first time that an effort has been made to operate a trickling filter under pure culture conditions. Consequently, a detailed description of the various parts of the apparatus and their function may be of interest. Referring to the designations as given in figure 1, the component parts of the set-up may be described as follows: (a) Five gallon pyrex carboy; (b) 16 liters of sterile synthetic sewage (for composition, etc., see Butterfield and McNamee (*3*)); (c) metal collar and clamp arranged to hold rubber stopper with its glass tube outlet firmly in place; (d) at this and other points, cotton packing so placed as to prevent the entrance of extraneous bacteria, molds, etc.; (d^1) filters of 6 to 12 inches of loosely packed cotton in all air lines; (e) screw clamp on rubber hose connection (this clamp was left open during sterilization to allow free exchange of air and steam when carboy was upright, but was closed during the assembling of the apparatus until the time of sampling the synthetic sewage, the connecting of it to unit B and the starting of the flow through the system; (f) pyrex glass tube constant level siphon (this tube must have its lower end beveled to facilitate the flow of air to (a) when the level of the sewage in (g) drops and sewage begins to flow into (g); (g) this is a 500 ml. pyrex bottle with side delivery outlet at the bottom, fitted with a two-holed rubber stopper, one hole for inlet sewage tube, the other hole for filtered air intake as sewage is discharged; (h) metal screw clamp on rubber tubing (i) to regulate the rate of flow of synthetic sewage; (j) pyrex glass tube with constricted tip to aid in regulation of flow; (k) pyrex glass cylinder 30 inches long and 2 inches in diameter. The overall length of tube (k) was limited to 30 inches, providing for a filter depth of about one-third that of a normal trickling filter, because no greater lengths could be placed in the autoclave and sterilized. For pure culture set-ups such sterilization was essential. (l) Gravel of ¼ to ½ inch diameter which filled tube (k) to a depth of 22 inches; (m) tight-fitting rubber stopper forced entirely into lower end of (k); (n) effluent tube extending through (m) with lower end beveled to aid flow and air-liquid interchange; (o) large glass tube used as a shield for (n). The annular ring of rubber in the rubber stopper between (n) and (o) was left in place to aid in holding tube (o) firm and rigid. (p) An electromagnet which when activated closes on tube (i) collapsing it and stopping the flow of sewage; (q) a 2.0 volt cell connected to electromagnet through a make and break circuit; (r) commutator wheel provided with ten equally spaced contact segments fastened on the extended axis of the hour hand shaft of a clock, thus providing in each 1-hour period ten 3-minute periods in

which sewage was distributed to the filter at the established rate and ten 3-minute periods in which no sewage flow occurred (variations in the flow and rest periods of the filter may be provided by varying the number and size of contact segments on this commutator (r)); (s) the clock which motivated the commutator (r); and (t) a sliding contact for the segments of (r) in the circuit of the 2-volt cell.

METHODS OF DEVELOPING GROWTH

In the development of appropriate growths on this experimental trickling filter two methods were tried for the initial seeding of the stones. In method No. 1 a small amount, 10 ml., of a broth culture of the organism under trial was dropped slowly onto the top stones of the filter and allowed to trickle through. The filter then stood from 1 to 2 hours before the flow of sterile synthetic sewage was started. This interval permitted the added bacteria to become somewhat more firmly attached to the stones. Initial flow of sewage for the first day or two was always carried on at a slow rate of less than 1.0 million gallons per acre per day. Such low flows provided ample food for the small numbers of bacteria present and did not produce any violent washing action to carry away bacterial growth before it had become established. With this method 1 week was required to obtain a satisfactory growth throughout the filter and 2 weeks were required for the filter to reach maximum efficiency.

With seeding method No. 2, 8 liteis of sterile synthetic sewage were inoculated with the test organism and aerated at 20° C. for 48 to 96 hours. Under such conditions a heavy, flocculent growth of these bacteria would develop. This 8 liter amount of growth was passed slowly through the gravel of the experimental trickling filter by means of a sterile siphon, while the filter drainage was carefully regulated by valves. By watching the location of the accumulation of growth added in this manner and making appropriate variations in the rate of flow, a very even distribution of the bacterial masses throughout the filter could be obtained. With this procedure also the seeded filter was allowed to stand quiescent for an hour or two after seeding before the initial slow flow of sewage was started. Using method No. 2 as much growth could be obtained in one day on the filter as in a week with method No. 1. Moreover, with method No. 2 maximum efficiencies would be obtained in a week. A photograph of a portion of this experimental filter with and without a fully developed growth of these bacteria in pure culture on the gravel of the filter is shown in figure 2. It is noted that the stones and adjoining sections of the retaining walls are covered heavily with growth. This growth is spongy and contains large amounts of moisture. Microscopic examinations indicated that it was composed entirely of bacterial cells. As observed above, this growth mass yielded a minimum bacterial count of 880 million per ml. of moist growth mass.

A Unseeded sterile filter

B Filter 7 days after seeding

FIGURE 2—Sections of pure culture trickling filter

TESTING PROCEDURES

The extent of purification of the synthetic sewage accomplished as it passed through these pure culture trickling filters was measured by comparing the 5-day biochemical oxygen demand of the influent with the corresponding 5-day B. O. D. of the filter effluent. These B. O. D. determinations were made in accordance with the standard procedure. Each pair of samples (influent and effluent) was put up for this determination in appropriate dilution and seeded. The seed used (1 ml. per liter of dilution) in each case consisted of settled domestic sewage after aeration for 24-hours at room temperature.

Rates of flow of the synthetic sewage through these pure culture filters were varied from less than 0.5 to 6.0 or more million gallons per acre per day. In the zone of 1.0 to 3.0 million gallons per acre per day tests made were repeated with greater frequency. These repetitions were made at various times during the life of the filter to provide observations on any variations in growth or in the condition of the filter as it aged. In all cases when a change in rate of flow was made, the filter was allowed to run at the new rate for a period, at least overnight, to allow for an adjustment to the new conditions of flow before a test was made.

RESULTS WITH PURE CULTURE TRICKLING FILTER

Results obtained in this manner by pure culture trickling filters developed (1) by culture 87 isolated as the predominant organism in the growth mass on the stones of a trickling filter fed with natural sewage, and (2) by culture 86, a typical zoogleal bacterium, isolated as the predominant organism in activated sludge, are presented in table 1. The same results are shown graphically in figure 3.

TABLE 1.—*Relative purification produced by pure culture trickling filter growths developed in an experimental trickling filter*

Range of flow in million gallons per acre per day	A. With culture 86 [1]			B. With culture 87 [2]		
	Average flow for period	Number of tests included in average	Percentage of 5-day B. O. D. removed	Average flow for period	Number of tests included in average	Percentage of 5-day B. O. D. removed
0.0–0.49	0.34	1	71.1	0.39	1	78.6
0.5–0.99	.92	3	52.1	.75	5	62.7
1.0–1.49	1.21	10	57.1	1.22	5	50.0
1.5–1.99	1.80	10	49.1	1.78	3	35.8
2.0–2.49	2.22	10	43.1	2.25	5	40.5
2.5–2.99	2.68	8	38.6	2.73	6	35.6
3.0–3.49	3.17	5	32.6	3.28	2	29.8
3.5–3.99	3.70	1	22.7	3.78	4	31.0
4.0–4.99	4.51	3	23.2	4.51	2	24.5
5.0–5.99	5.37	1	14.2	5.00	1	29.2
6.0–6.99	6.26	1	16.0	6.07	1	27.6
7.0–7.99	7.46	1	21.2	----------	----------	----------

[1] A predominant bacterium in activated sludge.
[2] A predominant bacterium in trickling filters.

Three observations may be made regarding the results presented. First, a marked purification of the synthetic sewage occurs as it passes through the filter. Second, there is a definite correlation between the rate of flow and the extent of purification. And third, the purification accomplished by the two pure culture systems is quite similar. That is, judging from the results obtained, these two organisms, one predominant in trickling filters, the other in activated sludge, may be used interchangeably in pure culture trickling filters without apparent variation in purification efficiency. Certain conditions affecting these observations will be considered.

With regard to the over-all purification accomplished by these pure culture trickling filter systems, it was planned at the start of the work

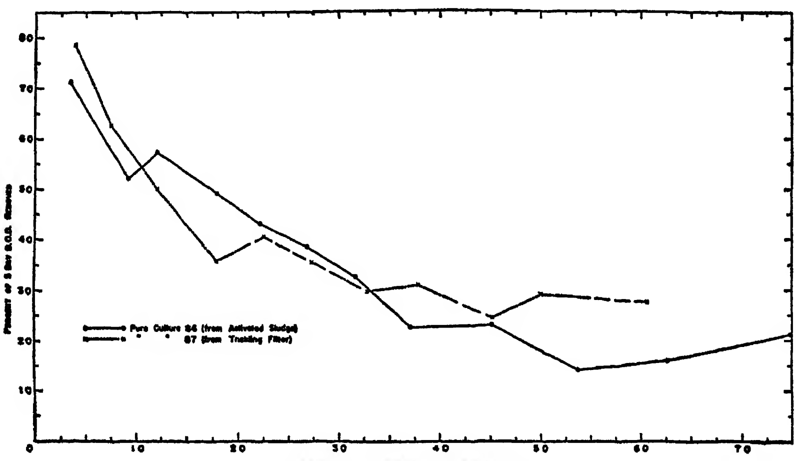


FIGURE 3.—Over-all purification by pure culture trickling filters with varying flow.

to make direct comparison of the results obtained with those observed in plant size units operated under natural conditions with all the flora and fauna of domestic sewage. The requirements for a pure culture set-up established limits which prevented such a direct comparison. For instance, as noted above, the depth of gravel in the pure culture filter was limited to 22 inches by the sterilization facilities while the depth of stone in a normal filter is about 60 to 72 inches. Correspondingly the time of flow through the stones of the pure culture filter was less than 1 minute (about 55 seconds) while flow through a normal filter requires 3 to 4 minutes.

Consequently, the extent of purification in a similar filter fed with raw domestic sewage containing all of its normal flora and fauna was determined. In each case the purification with the pure cultures approached that observed with a similar filter containing the normal flora and fauna.

While definite evidence is not available to show that the extent of

purification in a trickling filter varies directly with the depth of the filter or with the time the sewage is in contact with the growth on the filters, presumptive evidence suggests that this is the case. Therefore, the purification accomplished by the filter of 60 to 72 inches depth might be assumed to be about three times as great as that observed with a 22-inch filter. That is, on this basis, the purification of about 33 percent observed with the 22-inch filter at a flow of 3 million gallons per acre per day would be expected to be 90 to 100 percent with a filter of normal depth. Or, considered from another angle, the 22-inch filter flowing at a rate of 1 million gallons per acre per day might be expected to accomplish the purification of a normal depth filter flowing at a rate of 3 million gallons per acre per day. On the latter basis, the percentage of the 5-day biochemical oxygen demand removed would be in the range of 50 to 60 percent. With such allowances the degree of purification accomplished by these pure culture filters would be of almost the same order of magnitude as observed in a normal filter. Thus the purification accomplished by the pure culture trickling filters developed by the predominant bacteria isolated from a natural activated sludge equalled that accomplished by a similar trickling filter developed by the predominant bacterium in a trickling filter.

PURE CULTURE TRICKLING FILTER OPERATED AS CONTACT FILTER

At the conclusion of each run, when operating the pure culture filter as a trickling filter, it was operated for a time as a contact filter to compare the purification brought about by these two methods. To carry out this procedure the outlet (n) of the filter (see fig. 1) was closed by attaching a short piece of sterile rubber tubing with a clamp. The filter was then slowly filled to the top level of the stones and allowed to stand thus for 1 hour. The effluent was then slowly drained off and the filter allowed to rest for at least 3 hours before the test was repeated. The degree of purification was determined by comparing the 5-day B. O. D. of the influent with the corresponding B. O. D. of the effluent. This test as a contact filter was repeated 7 times using synthetic sewage, 11 times with sterilized natural sewage, and 5 times with raw natural sewage. The latter tests were conducted on the same day at the end of the run so that the additional inoculum introduced with the raw sewage would not have time to develop sufficiently to affect the results materially. The averages of the results obtained from these runs as a contact filter are given in table 2.

The amount of sewage required to fill this unit as a contact filter was a quantity that would provide an hour's flow at a rate of about 3.35 million gallons per acre per day. Consequently, as the sewage was held in contact for 1 hour the extent of purification may be

compared with the trickling filter results when operated at 3.35 million gallon rate. This rate of operation as a trickling filter (see fig. 3) had given an average reduction of the 5-day B. O. D. of about 30 percent. The purification accomplished by the contact process, with synthetic sewage in which all components are in solution, is approximately the same as the average obtained by the sprinkling procedure. However, the purification accomplished by this process with sterilized natural sewage and with raw sewage is considerably greater than with synthetic sewage. This may be explained by assuming for the contact method a 100 percent wetting of all of the active biological surfaces while with the sprinkling method some of the surfaces may escape such contact. The more reasonable explanation is that with natural sewage, sterilized or raw, a considerable portion of the 5-day B. O. D. is contained in colloidal and suspended matter. This fraction would be removed effectively by the filter, while in synthetic sewage no such suspended solids were present. It was not possible to make these observations satisfactorily with natural sewage on the pure culture trickling filter as the particles present in the sewage interfered with the establishment of a continuously uniform flow at the low rates required.

TABLE 2.—*Pure culture trickling filter (culture 86, table 1) operated as a contact filter with various feeds*

Nature of influent	Number of tests	Average contact period, hours	Percent of purification as measured by 5-day B. O. D. of influent and effluent
Synthetic sewage	7	1	28 2
Sterilized natural sewage	11	1	51 3
Raw natural sewage	5	1	61.1

RESULTS WITH PURE CULTURE ACTIVATED SLUDGE

Using the same pure cultures, No. 87 isolated from a trickling filter, No. 86 isolated from activated sludge, and a new culture, No. 103, isolated from a trickling filter, pure culture activated sludges were developed and their over-all purification efficiency using synthetic sewage was determined by the methods described by Butterfield (*1*). The results obtained from these tests are presented in table 3.

For purposes of comparison, the average results from a previous similar study (*2*) with activated sludge bacteria, zoogleal cultures Nos. 1, 4, and 9, are included in this table. This gives an opportunity to compare the results obtained with the older pure culture sludges (with a much heavier growth, 1,793 p. p. m. vs. 877 p. p. m. of suspended solids), with the newer sludge developed with culture 86.

TABLE 3.—*Over-all purification by pure culture activated sludges developed by bacteria isolated from various purification systems*

Designation	Cultures used	Source of culture	Amount of sludge in p. p. m.	Number of tests made	Percent of 5-day B. O. D. removed after aeration of:			
					1 hr.	3 hrs.	5 hrs.	24 hrs.
A	86	Activated sludge	877	4	34.9	52.0	62.2	61.0
B	87 and 103	Trickling filter	760	4	43.4	66.7	75.8	80.3
C	1, 4, and 9	Activated sludge	1793	5	34.6	78.1	82.1	88.8
Average of A and C					34.8	65.0	72.2	74.9

The amount of purification accomplished by the pure culture activated sludges produced by cultures 87 and 103, isolated as the predominant organisms of trickling filters, exceeds that accomplished by the activated sludge produced by culture 86, isolated from activated sludge, but does not equal the earlier results obtained with activated sludge cultures Nos. 1, 4, and 9. It must be noted, however, that these previous sludges were developed until they contained a much larger number of bacteria as measured by the amount of sludge produced. The average over-all purification accomplished by pure culture sludges produced by activated sludge bacteria cultures 1, 4, 9, and 86 (that is, the average of A and C as given in table 3) approximately equals that accomplished by the activated sludges produced by trickling filter bacteria, cultures 87 and 103. Thus it is observed that the predominant bacteria of a trickling filter can produce a pure culture activated sludge which functions at least as effectively as a similar sludge produced by the normal activated sludge bacteria.

RESULTS WITH BACTERIA-ONLY TRICKLING FILTERS AND ACTIVATED SLUDGES DEVELOPED BY SEVERAL STRAINS OF ZOOGLEAL BACTERIA

Detailed studies of the characteristics of the zoogleal bacteria isolated from activated sludges and from trickling filters have yielded interesting information. For instance, the various strains were identical with regard to certain major characteristics. They were all aerobic, gram-negative rods, producing capsules, not forming chains, forming zoogleal flocs or huge colonies in liquid media under aeration, and failing to ferment the ordinary sugars with gas production. They differed in certain minor characteristics such as the digestion of casein, the production of indol, and the utilization of nitrates.

These differences in activity suggest that while the extent of purification produced by sludges developed by these bacteria, each in pure culture, was approximately the same, the substances utilized by the various sludges may have varied in quality if not in quantity. This suggests further that a bacteria-only activated sludge or trickling filter produced by the combined growths of several of these strains of

bacteria would bring about a more complete purification. If these bacteria were the active agents, this purification would approach more uniformly, even with a feed whose constituents varied, the purification produced by a normal trickling filter, or activated sludge.

Accordingly, an experiment was carried out to determine the purification accomplished by a bacteria-only growth in a trickling filter and in activated sludge when the bacteria involved were a mixture of pure strains of zoogleal organisms. Nine pure culture strains were selected for this purpose: Cultures 53, 83, 85, 86, and 88 which had been isolated from activated sludges, and cultures 87, 100, 102, and 103, which had been obtained from the growths on the stones of trickling filters. In producing such growths each of 9 flasks containing 100 ml. of broth was inoculated with one of these strains in pure culture. They were held at 20° C. for 48 hours. By this time all 9 flasks had developed a heavy flocculent growth. The entire contents of each of the 9 flasks were then introduced into an aeration bottle containing 8 liters of synthetic sewage and aeration was started with storage at 20° C. While it was not possible to follow the relative growth of each of the 9 strains present in the aeration bottle, it was felt that the massive initial inoculation employed would give each strain an excellent opportunity to be well represented in the final growth subjected to test. Sludges produced in this manner will be referred to as "mixed pure culture" growths.

The 8 liter portion of synthetic sewage, thus inoculated and incubated at 20° C. under aeration, was fed daily with fresh synthetic sewage by the fill-and-draw method. That is, once daily, aeration was stopped, the bacterial sludge was allowed to settle for 30 minutes, 5 liters of clear supernatant were removed under aseptic conditions with a sterile siphon, 5 liters of sterile synthetic sewage were added, and aeration was resumed. When necessary, adjustments were made with sterile solutions to keep the hydrogen ion concentration in the range of pH 6.6 to 7.4. After a period of about 30 days, when bacterial sludge had developed to the extent of about 1,500 p. p. m. in terms of suspended solids (dry weight at 105° C.) the 8 liters were thoroughly mixed and divided into two equal portions. The sludge of one portion was transferred at once to a sterile trickling filter set-up, using method No. 2 described above, for observations on its efficiency in purifying synthetic sewage under these conditions. (For results see table 4, experiment IX.) Tests were made on the purification accomplished with various rates of flow during the next 7 days. The other portion of this "mixed pure culture" activated sludge was continuously maintained as an activated sludge with daily feedings as described above.

Tests were made of its purification efficiency as an activated sludge on the first (experiment 1A), third (experiment 1B), and seventh (experiment 1C) day of feeding from the time the portion was withdrawn to start the trickling filter set-up. (See table 5 for results.)

After the sludge of 1X had been in service for 13 days as a trickling filter sludge it was completely removed from the stones with aseptic precautions and put on test at once as an activated sludge. The results of the test with this sludge, 1X, are presented in table 5. It is noted that in this experiment practically none of the bacterial sludge was lost either as it was added to or removed from the trickling filter set-up. This is shown by approximately the same suspended solids content for portions 1C and 1X.

These observations with activated sludge and trickling filter purification by "mixed pure culture" growths were repeated under identical procedures in experiments 2A, 2B, and 2X. The only variation noted in experiment 2 is that apparently about one-third of the bacterial sludge was lost either in transferring the portion of sludge to, or removing it from, the trickling filter. This is shown by the variation in suspended solids content—1,666 for 2B and 904 for 2X. The results obtained in these two experiments, with averages, are presented in tables 4 and 5.

TABLE 4.—*Purification accomplished by a trickling filter developed by the growth of a mixture of 9 pure cultures of zoogleal bacteria*

Experiment 1X [1]				Experiment 2X [2]			
Hours from start	Rate of flow (million gallons, per acre per day)	Percent of 5-day B.O.D. removal	Remarks	Hours from start	Rate of flow (million gallons, per acre per day)	Percent of 5-day B.O.D. removal	Remarks
20	0.74	80.6		48	0.87	65.2	
44	1.78	78 0		72	1.47	66.6	
48	2 13	88.0		74	1.43	66.9	
68	2 83	86.6		76	1.43	66.2	
70	1 09	89.4		96	3.72	23.6	Flow suddenly increased at sampling period.
72	.93	91.2		98	1.36	27.9	
117	1.10	77.6		120	1.02	58.1	Ponding observed at intervals.
119	.68	84.2	Rate increased as soon as sampled.	124	1.12	58.0	
121	4.14	44.6		144	.88	54.5	
140	5.04	31.3		148	1.02	68.5	
142	3.41	12.8	Ponding complete, filter stones stirred up.	168	1.12	61.4	
164	2.89	70.2		216	1.80	28.4	Ponding complete, filter stones stirred up.

[1] See table 5 for purification accomplished by aliquot portions of the same mixed bacterial growths under conditions of activated sludge operation. Test 1A made at 20-hour period, 1B at 68-hour period, 1C at 164-hour period, and 1X with sludge washed from the growth on the stones of this filter.

[2] See table 5 for purification accomplished by aliquot portion of the same mixed bacterial growths under conditions of activated sludge operation. Test 2A made at 72-hour period, 2B at 168-hour period, and 2X with sludge washed from the growth on the stones of this filter.

TABLE 5.—*Purification accomplished by activated sludge*[1] *developed by the growth of a mixture of 9 pure cultures of zoogleal bacteria*

Experiment No.	Amount of sludge, p. p. m.	Percentage of 5-day B. O. D. removed after aeration for:				Percentage of 5-day B. O. D. oxidized after aeration for:			
		1 hr.	3 hrs.	5 hrs.	24 hrs.	1 hr.	3 hrs.	5 hrs.	24 hrs.
1A [2]	1536	34.3	40.8	86.4	90.7				
1B	1628	64.9	82.1	83.9	88.7				
1C	1558	53.7	77.7	81.2	81.5	38.4	62.2	67.9	84.6
1X	1598	57.9	84.8	79.8	81.4	23.6	43.0	52.9	63.6
2A		67.7	83.5	89.2	87.3				
2B	1666	50.5	85.1	89.7	85.1	23.3	43.7	48.6	59.7
2X	904	31.2	64.3	65.4	71.0	15.5	34.7	42.5	58.5
Average, 1A, 1B, 1C, 2A, and 2B		54.2	73.8	86.1	86.7	30.8	52.9	58.2	72.2
Average, 1X and 2X		44.6	74.6	72.6	76.2	19.6	38.8	47.7	61.0

[1] Sludges produced by the mixed growth of nine pure cultures of zoogleal bacteria, cultures 53, 83, 85, 86, 87, 88, 100, 102, and 108.

[2] Sludges 1A, 1B, 1C, 2A, and 2B produced and continuously maintained under aeration as an activated sludge. Sludges 1X and 2X developed as an activated sludge for about 30 days as an aliquot portion of 1A and 2A, then at the time tests of 1A and 2A were made sludge portions 1X and 2X were put on sterile trickling filters and used as a trickling filter for 13 days, then growth on stones of filter was washed off and tested at once as an activated sludge in 1X and 2X.

DISCUSSION OF RESULTS

Considering first the findings from the trickling filter studies, it is noted, as has been observed in the preceding experiments with pure culture trickling filters, that excellent results were obtained until partial or complete ponding of the filter occurred. Correction of this difficulty, by stirring the gravel in the ponded area, usually, but not always, restored normal operation after a few days. When normal results were not obtained it was assumed that the ponding action had blocked off certain portions of the growth in the filter even though an apparently normal resumption of flow had occurred. Such an effect might materially reduce the opportunity for contact between some of the bacterial masses and the inflowing bacterial food and at the same time would have a tendency to create anaerobic areas.

When the results presented in table 1 are compared with those in table 4, it is at once apparent that in the trickling filter set-up the "mixed pure culture" growth was more effective than the growth of any one pure culture. This difference was definitely in the favor of the "mixed pure culture" growth when the rate of flow was approximately 3 million gallons per acre per day. However, when the flow was near the rate of 1 million gallons per acre per day the increased efficiency of the "mixed pure culture" growth was the more marked. This latter rate of flow, as was noted above, is probably about the optimum for shallow filters of the depth required for the production of a set-up under pure culture conditions. Thus the results obtained with the "mixed pure culture" growth, reaching a maximum efficiency of removing approximately 90 percent of the 5-day B. O. D. of the influent, approach very closely the conditions of a normal trickling

filter. This suggests very definitely that these bacteria are the active agents in this purification process.

The results presented in tables 3 and 5 provide a similar comparison when the growths of these same organisms, in pure culture and in "mixed pure culture," are used as an activated sludge. Again it is observed that the "mixed pure culture" growth is the more effective. The maximum difference, about 40 percent, is found in the averages for the results obtained at the 1-hour aeration period. The differences observed at the 3-, 5-, and 24-hour aeration periods were considerably less but the "mixed pure culture" sludge consistently produced a higher percentage of B. O. D. removal.

In the averages presented in table 5 an interesting difference is observed between the purification produced by sludges 1A, 1B, 1C, 2A, and 2B (which had been produced and continuously maintained under aeration as an activated sludge) and the purification brought about by sludges 1X and 2X (which, while originally produced as an activated sludge, had been in service on a trickling filter for the 13 days immediately preceding these tests). With but one exception the sludges continuously maintained as activated sludges produced the higher degree of over-all purification. The one exception, the 3-hour period, was probably caused by one unusually high result in experiment 1X in this period. This difference between the activity of the two diversely treated sludges was more marked when measured by the portion of the 5-day B. O. D. oxidized [3] during the various aeration intervals. The "mixed pure culture" sludge in each instance produced a greater amount of oxidation, the greatest difference being observed during the first hour of aeration.

This difference in activity between the activated and trickling filter sludges is probably brought about by the condition of the sludges. The sludges which had been maintained under continuous conditions of activation were fed by the fill-and-draw method. At the time of test, 24 hours had elapsed since the last feeding and these sludges were probably relatively free of adsorbed material. The other sludges used in trickling filters immediately prior to these tests under conditions of activated sludge operation had been fed continuously up to the time of removal from the filters. These sludges were probably moderately loaded with adsorbed material when aeration was started. Their gradual improvement in purifying power at each subsequent aeration interval supports this assumption

[3] It may be pertinent to distinguish here the differences between the terms B. O. D. removed and B. O. D. oxidized, which are explained in detail in reference 2. When an activated sludge or a trickling filter is fed with sewage the initial but continuous step in the purification process is adsorption followed by oxidation and by synthesis of the adsorbed material into new bacterial protoplasm through growth and reproduction of cells. The B. O. D. removed is a measure of the over-all, or total, purification produced by the combined activities of adsorption, oxidation, and synthesis. The B. O. D. oxidized includes only that portion of the over-all purification which has been produced by actual oxidation

Perhaps the most interesting observation made in this study of the bacteria of trickling filters is that the zoogleal organisms found to be predominant in trickling filters and in activated sludge floc may be used interchangeably in pure culture set-ups without any material variations in the purification efficiency obtained. This interchangeability in pure culture trickling filters is shown quite definitely in the results presented in table 1 and in figure 3. The same interchangeability in purification by the activated sludge process is shown in table 3.

The interchangeability of these zoogleal bacteria in activated sludge is shown more clearly in figure 4. Here the average purification ac-

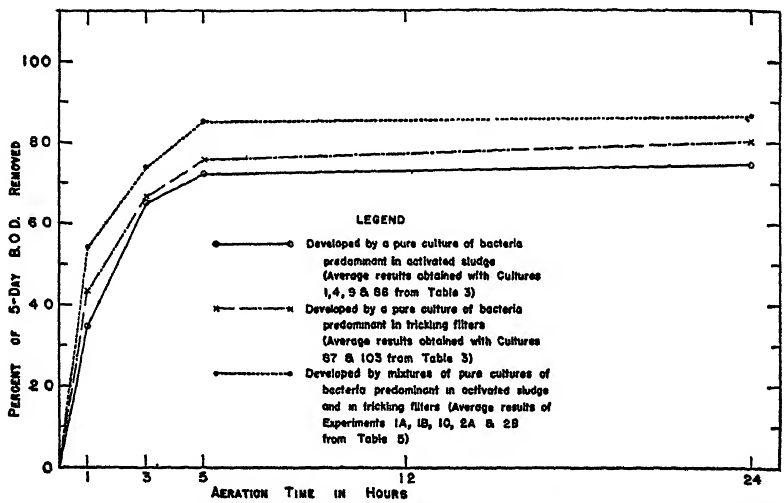


FIGURE 4.—Over-all purification produced by activated sludge developed by pure cultures of zoogleal bacteria.

complished by activated sludges, each developed by a pure culture of zoogleal bacteria isolated from natural activated sludge, is contrasted with the purification obtained with activated sludges each developed by a pure culture isolated from a normal trickling filter. In the average for sludges developed by bacteria isolated from activated sludge 9 experiments are included, 2 with culture No. 1, 1 with culture No. 4, 2 with culture No. 9, and 4 with culture No. 86, while 4 experiments, 2 with culture No. 87 and 2 with culture No. 103, are included in the average for sludges developed by bacteria isolated from normal trickling filters. Remarkable agreement at all aeration intervals is noted between the purification accomplished by the pure culture activated sludges developed by the zoogleal bacteria from the two sources, activated sludges and trickling filters. Moreover, the slight difference in purification noted, which is within the limits of variation observed between different cultures, favors the activated sludges developed by bacteria isolated from trickling filters.

The results obtained with the mixture of 9 pure cultures of these zoogleal bacteria, 4 isolated from trickling filters and 5 from activated sludges, are also shown in figure 4. It is noted that this "mixed pure culture" sludge produced a more extensive purification at each aeration interval, with the greatest change taking place during the first hour.

SUMMARY

The isolation in pure culture of the predominant bacteria found in the growths on the stones of experimental and municipal trickling filter sewage plants is reported. These bacteria are present at least to the extent of 300 million per ml. of filter growth. The organisms thus isolated and studied are zoogleal in nature and are similar to the predominant bacteria found in activated sludge.

The construction, method of inoculation, and operation of a trickling filter unit under pure culture conditions is described in detail.

These bacteria in pure culture, in this trickling filter unit, produced a growth on the stones of the filter which simulated a normal trickling filter both in appearance and in purification properties.

The predominant bacteria of activated sludge in pure culture are shown to have the same ability to produce adherent growths on the stones of a filter which in gross appearance and in purifying power simulates a normal trickling filter

Conversely, it is demonstrated that these bacteria, isolated as the predominant organisms in a trickling filter, will in pure culture produce a floc of the same general appearance as activated sludge. That is, these trickling filter bacteria also have the ability to grow in a liquid medium in a massed floc or colony bound together tenaciously enough to remain intact under the agitation of the aeration required to keep it suspended and to maintain aerobic conditions. This pure culture activated sludge during a 5-hour aeration interval removed about 76 percent of the 5-day B. O. D. of polluted waters.

A mixture of nine pure cultures of these zoogleal bacteria in both trickling filter and in activated sludge set-ups was more effective than any one strain in pure culture by itself. The extent of purification brought about by such a mixture was equivalent to that produced by a trickling filter or by an activated sludge containing all of the flora and fauna of normal sewage.

The results obtained show that the predominant zoogleal bacteria of trickling filters and of activated sludges may be used interchangeably without impairment of purification efficiency. These results also indicate very definitely that the members of this group of bacteria are the active agents in purification by biological processes and suggest that the maintenance of conditions favoring their growth would expedite such purification procedures.

ACKNOWLEDGMENTS

Appreciation is expressed to Principal Chemist C. C. Ruchhoft and the staff of the chemical laboratory of the Stream Pollution Investigations Station for their aid in carrying on the oxidation observations presented in table 5 and for making the determinations on suspended solids. Special consideration is due also to Senior Sanitary Engineer J. K. Hoskins for his most helpful suggestions and guidance throughout this investigation.

REFERENCES

(1) Butterfield, C. T.: Studies of sewage purification. II. A zooglea-forming bacterium isolated from activated sludge Pub. Health Rep , 50 671 (1935).
(2) Ruchhoft, C. C., Butterfield, C. T., McNamee, P. D., and Wattie, Elsie: Studies of sewage purification. IX Total purification, oxidation, adsorption and synthesis of nutrient substrates by activated sludge. Sewage Works J., 11:195 (1939). Pub. Health Rep., 54:468 (1939).
(3) Butterfield, C. T., Ruchhoft, C. C., and McNamee, P. D.: Studies of sewage purification. VI. Biochemical oxidation by sludges developed by pure cultures of bacteria isolated from activated sludge. Sewage Works J., 9:173 (1937). Pub. Health Rep., 52:387 (1937).

ORNITHODOROS PARKERI AND RELAPSING FEVER SPIROCHETES IN UTAH [1]

By Gordon E. Davis, *Senior Bacteriologist, United States Public Health Service*

Previous to the present investigation, specimens of *Ornithodoros parkeri* have been collected in Utah as follows: By field crews of the Plague Laboratory at San Francisco, Calif., 6 larvae from a golden mantled squirrel (*Citellus* sp.), Wayne County, 1936; 1 larva and 2 nymphs from a ground squirrel (*Cit. grammurus*), Washington County, 1938; 1 nymph from a prairie dog (*Cynomys* sp.), Uintah County, 1938; 5 nymphs from a prairie dog burrow, Emery County, 1939; and by Medical Entomologist Cornelius B. Philip, 6 specimens, Grand County, 1939. All but 2 lots were received in alcohol.

Two cases of relapsing fever have been reported in Utah, one in 1928 and the other in 1930. Both were thought to have originated west of Salt Lake City.

The present survey covered the period August 31 to September 8, 1940, and included parts of San Juan, Grand, Emery, Carbon, Uintah, Duchesne, Utah, Sanpete, Sevier, Piute, Garfield, Kane, Washington, Iron, Beaver, and Millard Counties.

Forty-nine lots of ticks ranging from 1 to 59 specimens were collected. Species determinations were made by Dr. R. A. Cooley. All but 1 lot were *O. parkeri*. A single specimen collected in San Juan County was *O. turicata* and constitutes the first record for this

[1] From the Rocky Mountain Laboratory, Hamilton, Mont., Division of Infectious Diseases, National Institute of Health.

species in Utah. The total number of *O. parkeri* collected was 306, of which 235 survived for testing for spirochetes. Twelve lots were collected in Uintah County, 5 in Carbon, 20 in Grand, 7 in Emery, and 4 in Iron. Spirochetes were recovered from 1 lot from Uintah County, one from Carbon, 2 from Emery, and 3 from Grand. These findings were based on a single test feeding on white mice.

Table 1 gives the laboratory accession number, the dates of collection, lot number, number of lots, the number of ticks in each lot and the number tested, the habitat, the collector, and the results of testing for spirochetes.

TABLE 1.—*Ornithodoros parkeri and relapsing fever spirochetes in Utah*

Accession No.	County	Date collected	Lot No.	Number of ticks: Collected	Number of ticks: Tested	Habitat	Collector	Spirochetes
16634	Emery	June 22, 1939	1	5	2	Prairie dog burrow	Plague laboratory.	Not found.
16141	Grand	Sept. 15, 1939	2	6	6	do	Philip	Present.
17130	San Juan	Aug. 31, 1940	3	[1] 1	1	Burrow	Davis	Not found.
17132	Grand	Sept. 1, 1940	4	5	2	Prairie dog burrow	do	Do.
17133	do	do	5	7	7	Burrow	do	Do.
17134	do	do	6	8	3	Prairie dog burrow	do	Do.
17135	do	do	7	2	2	Burrow	do	Do.
17136	do	do	8	9	9	Prairie dog burrow	do	Do.
17137	do	do	9	3	3	do	do	Do.
17138	do	do	10	8	8	Burrow	do	Present.
17139	do	do	11	10	9	Prairie dog burrow	do	Not found.
17140	do	do	12	2	2	do	do	Present.
17141	do	do	13	4	2	do	do	Not found.
17143	do	do	14	7	7	do	do	Do.
17144	do	do	15	2	2	do	do	Do.
17145	do	do	16	3	3	do	do	Do.
17146	do	do	17	9	6	do	do	Do.
17147	do	do	18	6	4	do	do	Do
17148	do	do	19	9	7	do	do	Present.
17149	do	do	20	2	2	do	do	Not found.
17150	do	do	21	2	2	do	do	Do.
17151	do	do	22	42	38	do	do	Do.
17351	do	do	23	3	2	do	do	Do.
17356	Emery	Sept. 2, 1940	24	1	1	do	do	Do.
17357	do	do	25	3	3	do	do	Present.
17358	do	do	26	1	1	do	do	Not found.
17359	do	do	27	5	4	do	do	Do.
17360	do	do	28	4	3	do	do	Do.
17361	do	do	29	2	2	do	do	Do.
17367	do	do	30	10	10	do	do	Present.
17362	Carbon	Sept. 3, 1940	31	1	1	do	do	Not found.
17363	do	do	32	2	2	Burrow	do	Do.
17364	do	do	33	4	4	Prairie dog burrow	do	Do.
17365	do	do	34	3	3	do	do	Do.
17366	do	do	35	12	10	do	do	Present.
17368	Uintah	Sept. 5, 1940	36	4	4	do	do	Not found.
17369	do	do	37	6	6	do	do	Do.
17370	do	do	38	2	2	do	do	Do.
17371	do	do	39	3	3	do	do	Do.
17372	do	do	40	7	6	do	do	Do.
17373	do	do	41	1	1	do	do	Do.
17374	do	do	42	13	13	do	do	Present.
17375	do	do	43	2	2	do	do	Not found.
17376	do	do	44	4	4	do	do	Do.
17377	do	do	45	4	4	do	do	Do.
17378	do	do	46	10	10	do	do	Do.
17379	do	do	47	1	1	do	do	Do.
17381	Iron	Sept. 8, 1940	48	1	1	do	do	Do.
17382	do	do	49	1	1	do	do	Do.
17384	do	do	50	1	1	do	do	Do.
17385	do	do	51	59	11	do	do	Do.

[1] *O. turicata.*

Figure 1 shows the areas in which *O. parkeri* and the one specimen of *O. turicata* were collected. The recovery of spirochetes is indicated by "S". With the exception of Emery County, the exact locations of the collections made by the staff members of the Plague Laboratory are unknown to us.

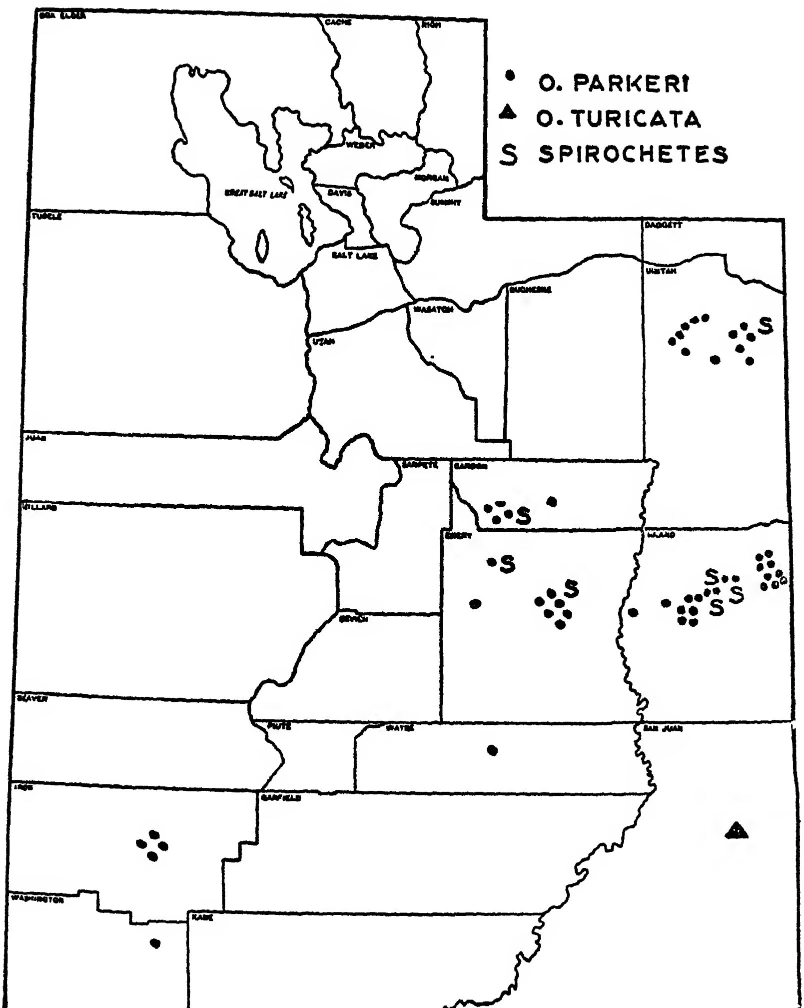


FIGURE 1.—*O. parkeri* and relapsing fever spirochetes in Utah.

DISCUSSION

As ground squirrels (*Citellus* sp.) were already in hibernation, the chief guide in the search for ticks was the presence of prairie dog burrows which could be seen easily from the highway. Doubtless,

this overemphasizes the presence of this species in these burrows, as *O. parkeri* has been collected from numerous other rodents and from burrowing owls.

The area southeast of the Colorado River is arid and the terrain for the most part bluffs and canyons. It was in this area that the one specimen of *O. turicata* was found. In the early morning, sandy areas revealed something of the "night life" in the innumerable tracks of small rodents, especially mice and kangaroo rats. Many of the small kangaroo rat burrows were examined and a number of these rats were taken in box traps but no ticks were found. Central Utah from northeast to southwest is, to a great extent, under cultivation. There were no indications of prairie dogs over large areas. In Duchesne County, three extensive prairie dog towns, one of which contained many animals, were examined but no ticks were found.

In Iron County, in southwestern Utah, a prairie dog "ghost town" was investigated. The absence of rodents and the condition of the burrows suggested that the town had been vacant for some time and aroused speculation concerning the possible presence of plague, a human case of which had occurred east of this area. The openings to the burrows were clogged by dried vegetation, and skeletal remains of prairie dogs were found in two burrows. However, *O. parkeri* was found in four burrows. The absence of early immature forms and of engorged ticks further suggested that hosts had not been recently present.

Although the openings to prairie dog burrows are often well protected against washing as the result of heavy rains, yet in one area, during a heavy shower, such washing was quite in evidence. In such instances many early unfed immature ticks must be entrapped in the mud flow.

One of the strains of spirochetes was studied in white mice, white rats, and guinea pigs. Relapses were observed in all three hosts. These tests were made by allowing a series of uninfected *O. parkeri*, in the first nymphal stage, to engorge on a white mouse infected with the strain of spirochetes under study and subsequently to engorge on normal animals. Eleven of this series of ticks were tested individually by feeding on white mice, 16 on white rats, and 8 on guinea pigs. Spirochetes were observed in the peripheral blood of mice up to 31 days following tick feeding, at which time the mouse observed for this period died, in white rats for as long as 26 days, and in guinea pigs up to 30 days. Temperatures of the guinea pigs were taken daily for 6 weeks. One guinea pig showed only 1 relapse, 6 showed 2 relapses, and 1 showed 3 relapses. The appearance of spirochetes closely paralleled a rise in temperature.

SUMMARY

During the late summer of 1940, 49 lots of *Ornithodoros* ranging from 1 to 59 specimens were collected in San Juan, Grand, Uintah, Carbon, Emery, and Iron Counties in Utah. There was a total of 306 ticks, 235 of which survived for testing for spirochetes. The one specimen collected in San Juan County was *O. turicata;* the rest were *O. parkeri.* Spirochetes were recovered from ticks collected in Uintah, Grand, Carbon, and Emery Counties. White mice, white rats, and guinea pigs were shown to be susceptible to one of the strains. Relapses occurred in all three host species. The appearance of spirochetes in the ear blood of guinea pigs closely paralleled a rise in temperature.

DISEASE OUTBREAKS FROM WATER, MILK, AND OTHER FOODS IN 1939—CORRECTION

In the article with the above title, by Senior Sanitary Engineer A. W. Fuchs, which appeared in the Public Health Reports of November 28, 1941, table 5, page 2281, shows a water-borne outbreak involving 325 cases as occurring in the State of New Jersey. This table should be corrected by the addition of a footnote referring to this outbreak, as follows: In this outbreak, involving 325 cases of gastro-enteritis, ice was suspected as the vehicle. Attention is called to footnote 1 of table 3, which also refers to this outbreak.

DEATHS DURING WEEK ENDED DECEMBER 13, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 13, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	8,407	8,631
Average for 3 prior years	8,539	
Total deaths, first 50 weeks of year	416,899	417,804
Deaths per 1,000 population, first 50 weeks of year, annual rate	11.7	11.7
Deaths under 1 year of age	566	565
Average for 3 prior years	521	
Deaths under 1 year of age, first 50 weeks of year	26,478	25,164
Data from industrial insurance companies:		
Policies in force	64,719,421	64,791,753
Number of death claims	10,750	11,293
Death claims per 1,000 policies in force, annual rate	8.7	9.1
Death claims per 1,000 policies, first 50 weeks of year, annual rate	9.3	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 20, 1941

Summary

General health conditions in the United States continue favorable, as indicated by reports of important communicable diseases and the mortality rate for a group of 88 large cities. None of the communicable diseases is epidemic for the country as a whole; in fact the incidence of most of these diseases reported currently to the Public Health Service is below the 5-year median expectancy. The current mortality rate for 88 large cities is slightly above the 3-year average, but the cumulative rate to date for these cities is the same as for the corresponding period last year.

The number of reported cases of influenza decreased as compared with last week (2,693 as compared with 2,995). Texas, with 1,320 cases, reported about half of the current cases. The 5-year median for the current week is 2,225, while 42,457 cases were reported for the corresponding week last year.

The incidence of poliomyelitis remains slightly above the 5-year median, due to 11 cases in Alabama (1 case last week), 7 in New York (8 last week), and 6 in Illinois (5 last week). No other State reported more than 3 cases for the current week.

Of 62 cases of endemic typhus fever, 22 occurred in Georgia, 14 in Alabama, and 7 in Texas. One case of tularemia was reported in each of the following named States: Kansas, Maryland, and North Carolina.

The crude death rate for 88 large cities for the current week was 12.2 as compared with 11.8 for the preceding week and with a 3-year (1938–40) average of 12.0.

Telegraphic morbidity reports from State health officers for the week ended December 20, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	Dec. 20, 1941	Dec. 21, 1940		Dec. 20, 1941	Dec. 21, 1940		Dec. 20, 1941	Dec. 21, 1940		Dec. 20, 1941	Dec. 21, 1940	
NEW ENG.												
Maine	1	0	4	-------	3	1	174	37	37	1	1	1
New Hampshire	0	0	0	-------	2	-------	6	4	4	0	0	0
Vermont	0	0	0	-------	-------	-------	3	37	25	0	0	0
Massachusetts	4	1	5	-------	-------	-------	167	294	196	2	3	1
Rhode Island	1	0	0	1	1	-------	21	0	3	0	0	0
Connecticut	0	0	2	1	2	3	61	6	67	0	0	0
MID. ATL.												
New York [1]	22	20	23	[1] 6	[1] 41	[1] 15	294	1,194	395	3	6	5
New Jersey	7	8	8	13	4	6	51	336	158	1	0	0
Pennsylvania	9	17	44	-------	-------	-------	678	1,121	67	5	1	6
E. NO. CEN.												
Ohio	16	5	17	17	12	8	108	42	22	1	2	2
Indiana	2	8	19	20	979	31	11	83	12	0	0	0
Illinois	45	17	37	11	23	23	64	669	27	0	0	0
Michigan [2]	8	7	9	2	2	1	59	790	253	0	1	1
Wisconsin	0	0	1	22	42	42	142	330	103	1	0	0
W. NO. CEN.												
Minnesota	4	1	2	2	1	1	72	29	29	1	0	0
Iowa	0	3	5	1	8	5	69	133	69	0	0	0
Missouri	5	10	10	2	6	59	13	15	7	1	3	1
North Dakota	0	3	1	4	52	6	115	12	2	0	1	0
South Dakota	4	4	4	-------	-------	-------	7	1	1	0	0	0
Nebraska	2	0	2	2	-------	-------	14	8	3	0	0	0
Kansas	9	3	5	15	269	4	109	70	59	1	1	2
SO. ATL.												
Delaware	0	2	0	-------	-------	-------	1	25	5	0	0	0
Maryland [2]	13	0	10	3	4	10	114	1	5	0	0	0
Dist. of Col.	0	4	5	-------	3	3	5	3	3	1	1	0
Virginia	14	10	30	152	203	83	86	41	46	0	2	2
West Virginia	6	12	11	18	38	38	135	6	12	0	1	2
North Carolina [3]	38	28	39	11	10	10	257	31	145	0	2	1
South Carolina [3]	6	4	4	421	315	315	24	21	7	0	0	1
Georgia [3]	18	7	15	50	178	178	75	18	9	0	0	0
Florida [3]	10	3	8	9	28	9	57	2	3	1	1	2
E. SO. CEN.												
Kentucky	5	3	9	4	184	31	12	195	60	0	1	3
Tennessee	11	11	11	28	52	52	67	29	29	3	0	2
Alabama [3]	23	11	18	66	222	170	20	61	19	0	2	1
Mississippi [2]	10	5	5	-------	-------	-------	-------	-------	-------	3	1	1
W. SO. CEN.												
Arkansas	11	5	5	97	2,191	79	68	28	9	0	0	0
Louisiana [3]	10	3	9	3	8,000	12	11	1	1	1	1	0
Oklahoma	6	15	15	97	1,369	119	11	0	9	0	0	1
Texas [3]	64	36	50	1,320	1,236	561	270	35	72	1	1	2
MOUNTAIN												
Montana	1	0	0	9	106	65	80	1	4	0	0	0
Idaho	2	0	0	-------	51	4	2	3	13	0	0	0
Wyoming	1	0	1	4	1,085	-------	14	1	1	0	0	0
Colorado	18	4	11	36	47	7	420	79	24	0	0	0
New Mexico	0	1	3	-------	27	2	10	66	44	0	0	0
Arizona	0	2	3	126	1,006	93	33	38	8	0	0	0
Utah [2]	0	0	0	2	5,133	17	19	3	38	0	0	1
Nevada	0	-------	-------	-------	1,000	-------	0	-------	-------	0	-------	-------
PACIFIC												
Washington	3	0	2	3	3,796	-------	4	182	146	0	2	1
Oregon	0	3	1	13	2,645	71	45	5	10	0	0	0
California [3]	15	5	26	102	12,081	58	500	53	53	1	0	1
Total	424	281	525	2,693	42,457	2,225	4,608	6,079	4,544	28	34	41
51 weeks	16,571	15,413	27,196	595,386	264,194	182,255	864,454	269,654	291,343	1,986	1,638	2,781

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 20, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis: Week ended Dec. 20, 1941	Poliomyelitis: Week ended Dec. 21, 1940	Poliomyelitis: Median 1936–40	Scarlet fever: Week ended Dec. 20, 1941	Scarlet fever: Week ended Dec. 21, 1940	Scarlet fever: Median 1936–40	Smallpox: Week ended Dec. 20, 1941	Smallpox: Week ended Dec. 21, 1940	Smallpox: Median 1936–40	Typhoid and paratyphoid fever: Week ended Dec. 20, 1941	Typhoid and paratyphoid fever: Week ended Dec. 21, 1940	Typhoid and paratyphoid fever: Median 1936–40
NEW. ENG.												
Maine	1	0	0	32	19	16	0	0	0	3	1	1
New Hampshire	2	0	0	16	6	6	0	0	0	0	0	0
Vermont	1	0	0	1	11	7	0	0	0	0	0	0
Massachusetts	1	0	0	259	145	145	0	0	0	3	0	1
Rhode Island	0	0	0	5	2	7	0	0	0	1	0	0
Connecticut	0	0	0	23	33	57	0	0	0	0	2	1
MID. ATL.												
New York [3]	7	1	1	297	284	350	0	0	0	6	19	8
New Jersey	1	0	0	92	137	103	0	0	0	0	0	1
Pennsylvania	1	1	1	245	218	343	0	0	0	6	7	9
E. NO. CEN.												
Ohio	1	2	1	268	167	258	0	1	2	2	3	3
Indiana	0	2	0	45	84	126	0	1	5	1	1	2
Illinois	6	3	1	230	334	355	1	6	3	2	4	4
Michigan [2]	0	5	1	155	182	344	1	5	2	3	1	2
Wisconsin	1	10	1	153	127	141	0	6	6	1	0	1
W. NO. CEN.												
Minnesota	1	2	1	76	78	93	0	17	17	0	1	1
Iowa	0	2	0	56	70	99	0	2	5	1	1	1
Missouri	0	0	0	35	79	101	4	2	3	3	6	5
North Dakota	0	0	0	13	12	22	0	1	1	0	0	0
South Dakota	0	1	1	25	17	17	2	2	4	0	0	0
Nebraska	0	2	1	25	27	27	0	1	1	0	0	0
Kansas	0	0	0	85	82	115	0	0	0	0	0	0
SO. ATL.												
Delaware	0	1	0	19	18	18	0	0	0	0	0	0
Maryland [2]	2	1	0	43	39	46	0	0	0	8	0	8
Dist. of Col.	0	0	0	22	7	8	0	0	0	1	1	1
Virginia	1	3	1	38	17	31	0	0	0	5	3	3
West Virginia	1	3	1	67	41	71	0	0	0	3	2	2
North Carolina [3]	0	0	0	72	87	65	0	0	0	0	2	1
South Carolina [3]	0	0	0	5	10	10	0	0	0	2	0	1
Georgia [3]	1	0	0	23	16	21	0	0	0	1	6	6
Florida [3]	0	0	0	10	1	8	0	0	0	2	0	0
E. SO. CEN.												
Kentucky	0	0	0	85	59	60	1	0	0	3	2	2
Tennessee	2	0	0	40	58	45	2	0	0	2	2	2
Alabama	11	1	1	35	25	23	0	0	0	2	1	3
Mississippi [3]	0	0	0	24	9	8	1	0	0	1	0	1
W. SO. CEN.												
Arkansas	3	0	0	16	5	12	0	0	0	3	3	3
Louisiana [3]	1	3	1	8	20	16	0	0	0	1	16	6
Oklahoma	0	0	2	17	24	24	0	2	2	1	0	2
Texas [3]	3	1	1	48	32	84	5	0	4	7	4	12
MOUNTAIN												
Montana	1	0	0	38	30	30	0	0	1	1	0	0
Idaho	0	0	0	7	9	18	0	0	0	0	1	1
Wyoming	0	0	0	1	11	11	0	0	1	0	0	0
Colorado	0	0	0	29	17	24	0	1	7	0	0	1
New Mexico	0	0	0	6	7	22	0	0	0	0	5	3
Arizona	0	0	0	5	1	5	0	0	0	1	1	1
Utah [2]	0	1	0	9	6	15	0	0	0	0	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	1	1	1	44	38	48	2	0	0	3	0	0
Oregon	2	1	0	10	7	82	0	0	6	2	0	1
California [3]	3	1	1	107	68	142	0	0	4	8	5	5
Total	55	48	45	2,979	2,776	3,599	19	47	141	89	100	103
51 weeks	9,017	9,733	7,261	124,854	152,425	183,035	1,351	2,401	9,456	8,433	9,505	14,126

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended December 20, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough, Week ended Dec. 20, 1941	Whooping cough, Week ended Dec. 21, 1940	Division and State	Whooping cough, Week ended Dec. 20, 1941	Whooping cough, Week ended Dec. 21, 1940
NEW ENG.					
Maine	26	19			
New Hampshire	9	7	Georgia [3]	10	13
Vermont	23	18	Florida [3]	12	3
Massachusetts	206	274	E. SO. CEN.		
Rhode Island	59	4			
Connecticut	43	81	Kentucky	52	51
MID. ATL.			Tennessee	19	58
			Alabama [3]	6	47
New York [3]	504	410	Mississippi [3]	----------	----------
New Jersey	176	162			
Pennsylvania	228	571	W. SO. CEN.		
E. NO. CEN.			Arkansas	8	34
Ohio	205	192	Louisiana [3]	5	5
Indiana	13	10	Oklahoma	3	13
Illinois	221	171	Texas [3]	121	142
Michigan [2]	209	285			
Wisconsin	282	128	MOUNTAIN		
W. NO. CEN.			Montana	25	3
			Idaho	30	18
Minnesota	47	70	Wyoming	3	0
Iowa	9	22	Colorado	35	40
Missouri	12	51	New Mexico	11	15
North Dakota	3	11	Arizona	23	1
South Dakota	2	12	Utah [2]	24	11
Nebraska	0	9	Nevada	0	----------
Kansas	39	64			
SO. ATL.			PACIFIC		
Delaware	0	39	Washington	104	36
Maryland [2]	20	66	Oregon	21	12
Dist. of Col.	16	13	California [3]	137	149
Virginia	30	71			
West Virginia	14	34	Total	3,176	3,713
North Carolina [3]	85	239			
South Carolina [3]	46	29	51 weeks	205,930	167,944

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Dec. 20, 1941, 62 cases, as follows: New York, 1; North Carolina, 5; South Carolina, 1; Georgia, 22; Florida, 3; Alabama, 14; Mississippi, 2; Louisiana, 4; Texas, 7; California, 3.

WEEKLY REPORTS FROM CITIES

City reports for week ended December 6, 1941

This table lists the reports from 135 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	1	1	2	1	10	0	0	0	6	23
New Hampshire:											
Concord	0	------	0	0	0	1	0	2	0	0	18
Manchester	0	------	1	2	0	18	0	0	0	1	13
Nashua	1	------	0	1	0	2	0	0	0	9	11
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	--------
Burlington	0	------	0	0	0	0	0	0	0	0	8
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	2	------	0	23	9	51	0	7	3	40	194
Fall River	2	------	0	0	6	21	0	2	0	2	44
Springfield	0	------	0	8	0	19	0	0	0	26	25
Worcester	0	------	0	3	3	21	0	2	0	18	45
Rhode Island:											
Pawtucket	1	------	0	12	0	2	0	0	0	2	11
Providence	3	------	0	2	0	8	0	0	0	36	59
Connecticut:											
Bridgeport	0	------	0	1	0	7	0	0	1	3	40
Hartford	0	------	0	2	5	1	0	0	0	2	47
New Haven	0	------	0	35	1	3	0	0	0	1	33
New York:											
Buffalo	0	------	0	0	9	14	0	7	0	16	159
New York	15	8	0	20	69	94	0	66	2	372	1,455
Rochester	0	------	0	3	2	7	0	1	0	17	71
Syracuse	0	------	0	0	2	2	0	0	0	41	56
New Jersey:											
Camden	0	------	0	0	6	2	0	0	0	12	38
Newark	0	------	0	7	4	21	0	2	0	39	96
Trenton	1	------	0	0	2	8	0	4	0	6	32
Pennsylvania:											
Philadelphia	2	4	2	3	24	69	0	17	0	46	480
Pittsburgh	0	2	3	1	12	17	0	6	1	13	184
Reading	0	------	0	1	2	1	0	1	0	0	36
Ohio:											
Cincinnati	5	------	0	0	3	17	0	7	0	17	143
Cleveland	4	5	0	2	7	40	0	20	0	38	211
Columbus	0	------	0	3	3	2	0	2	5	2	71
Toledo	0	------	0	0	2	2	0	1	0	22	71
Indiana:											
Anderson	2	------	0	0	1	0	0	0	0	0	4
Fort Wayne	0	------	0	0	2	0	0	1	0	0	29
Indianapolis	0	------	1	0	3	18	0	7	0	7	102
Muncie	0	------	0	0	0	0	0	1	0	4	12
South Bend	0	------	0	0	0	1	0	0	0	0	22
Terre Haute	0	------	0	0	5	0	0	0	0	0	21
Illinois:											
Chicago	27	4	2	9	32	76	0	41	0	123	682
Elgin	0	------	0	0	0	0	0	0	0	1	12
Moline	0	------	0	1	0	0	0	0	0	7	8
Springfield	1	------	0	0	2	2	0	0	0	0	23
Michigan:											
Detroit	3	------	0	21	12	79	0	13	1	84	274
Flint	0	------	0	0	3	1	0	0	1	4	29
Grand Rapids	0	------	0	2	1	7	0	0	0	1	34
Wisconsin:											
Kenosha	0	------	0	0	0	3	0	0	0	4	6
Madison	0	------	0	4	1	1	0	0	0	9	26
Milwaukee	0	------	1	6	3	26	0	3	0	0	102
Racine	0	------	0	1	0	9	1	0	1	19	13
Superior	0	------	0	0	0	0	0	0	0	4	6
Minnesota:											
Duluth	0	------	0	1	0	2	0	0	0	8	28
Minneapolis	0	------	0	0	3	8	1	2	0	16	88
St. Paul	0	------	0	3	1	2	0	2	0	31	71
Iowa:											
Cedar Rapids	0	------	--------	0	-------	3	0	-------	0	0	--------
Davenport	0	------	--------	0	-------	6	0	-------	0	6	--------
Des Moines	2	------	--------	2	-------	3	0	-------	0	0	33
Sioux City	0	------	--------	2	-------	0	0	-------	0	0	--------
Waterloo	0		----	1	-------	2	0	-------	0	2	--------

City reports for week ended December 6, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Missouri:											
Kansas City	0	------	1	1	6	5	0	2	0	1	94
St. Joseph	0	------	0	5	4	2	0	1	0	0	32
St. Louis	0	6	0	1	12	13	0	5	0	2	199
North Dakota:											
Fargo	0	------	0	0	1	0	0	0	0	0	15
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	21	------	0	0	------	0	0	4
South Dakota:											
Aberdeen	0	------	------	0	------	5	0	------	0	0	------
Sioux Falls	0	------	------	0	------	1	0	------	0	0	6
Nebraska:											
Lincoln	0	------	------	0	------	2	0	------	0	0	------
Omaha	0	------	0	0	4	5	0	1	0	0	58
Kansas:											
Lawrence	0	3	0	0	1	0	0	0	0	0	6
Topeka	0	------	0	1	1	7	0	0	0	11	23
Wichita	0	3	0	1	2	2	0	1	0	4	30
Delaware:											
Wilmington	0	------	0	0	2	1	0	0	0	0	31
Maryland:											
Baltimore	2	2	1	83	11	17	0	6	0	24	233
Cumberland	0	------	0	0	0	1	0	0	2	0	3
Frederick	0	------	0	0	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	0	2	1	4	9	15	0	8	1	20	163
Virginia:											
Lynchburg	0	------	0	0	1	2	0	0	0	3	12
Norfolk	1	------	0	1	0	3	0	0	0	1	23
Richmond	3	------	2	0	1	2	0	1	0	0	49
Roanoke	0	------	0	1	1	1	0	0	0	0	14
West Virginia:											
Charleston	0	------	0	0	1	0	0	0	0	0	27
Huntington	2	------	------	0	------	1	0	------	0	0	------
Wheeling	0	------	0	6	1	1	0	0	0	0	23
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	0	0	0	0	0	0	3	8
Wilmington	0	------	0	8	0	1	0	3	0	0	13
Winston-Salem	2	------	0	71	2	0	0	0	0	0	12
South Carolina:											
Charleston	2	65	1	0	1	2	0	0	0	3	30
Florence	0	------	0	0	0	0	0	0	0	0	12
Greenville	1	------	0	2	0	1	0	0	0	1	4
Georgia:											
Atlanta	0	7	3	0	1	9	0	7	0	1	96
Brunswick	0	------	0	0	2	0	0	0	0	0	6
Savannah	0	------	0	13	2	3	0	0	0	0	34
Florida:											
Miami	0	3	0	0	0	0	0	2	0	3	48
St. Petersburg	0	------	0	0	2	0	0	0	0	3	28
Tampa	0	------	0	0	1	0	0	1	0	0	20
Kentucky:											
Ashland	1	------	0	1	0	1	0	1	0	12	5
Covington	1	------	0	2	1	4	0	1	0	0	12
Lexington	0	------	0	0	2	0	0	0	0	4	14
Louisville	1	1	0	1	2	24	0	3	0	31	71
Tennessee:											
Knoxville	0	2	0	4	0	1	0	1	0	1	17
Memphis	2	4	1	0	0	4	0	5	0	15	117
Nashville	1	------	0	1	1	2	0	0	0	0	44
Alabama:											
Birmingham	1	------	0	0	8	7	0	2	1	1	89
Mobile	1	1	0	1	3	0	0	2	0	0	26
Montgomery	0	------	------	0	------	1	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	2	------	0	0	------	0	1	------
Little Rock	0	15	0	0	3	0	0	0	0	2	37
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	5
New Orleans	0	6	2	1	11	7	0	6	1	2	103
Shreveport	0	------	0	0	5	0	0	0	0	0	42
Oklahoma:											
Oklahoma City	2	------	0	0	4	0	0	1	0	0	43
Tulsa	3	------	0	94	0	6	0	1	0	0	6
Texas:											
Dallas	8	1	1	50	0	13	0	0	0	6	53
Fort Worth	0	------	1	0	1	2	0	0	0	6	29
Galveston	0	------	0	0	0	0	0	1	0	0	15
Houston	2	------	0	1	13	4	0	6	0	1	91
San Antonio	1	15	3	0	5	2	0	4	0	0	75

City reports for week ended December 6, 1941—Continued

State and city	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	10
Great Falls	0	------	0	39	0	0	0	0	0	16	12
Helena	0	------	0	0	0	5	0	0	0	3	4
Missoula	0	------	0	2	0	0	0	0	0	0	3
Idaho:											
Boise	0	------	0	2	2	1	0	1	0	0	13
Colorado:											
Colorado Springs	0	------	0	0	0	3	0	0	0	6	4
Denver	11	28	0	22	7	6	0	3	0	8	74
Pueblo	0	------	0	174	8	1	0	1	0	0	9
New Mexico:											
Albuquerque	0	------	0	0	0	1	0	1	1	0	9
Arizona:											
Phoenix	1	38	------	0	------	1	0	------	0	7	------
Utah:											
Salt Lake City	0	------	0	2	3	3	0	1	0	8	37
Washington:											
Seattle	0	------	0	1	8	2	0	2	0	55	81
Spokane	0	2	0	0	2	3	0	0	0	0	39
Tacoma	0	------	0	0	1	2	0	0	0	1	28
Oregon:											
Portland	1	2	0	0	3	4	0	1	0	3	86
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	4	19	2	15	2	31	0	17	2	21	331
Sacramento	0	------	0	9	4	2	0	1	0	4	29
San Francisco	0	3	0	1	5	6	0	4	0	3	185

State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases	State and city	Meningitis, meningococcus Cases	Meningitis, meningococcus Deaths	Poliomyelitis cases
Massachusetts:				Maryland:			
Worcester	1	0	0	Baltimore	3	1	0
New York:				South Carolina:			
Buffalo	0	1	0	Florence	0	1	0
New York	2	1	1	Kentucky:			
Rochester	0	0	3	Louisville	1	0	0
New Jersey:				Tennessee:			
Trenton	0	0	1	Knoxville	0	0	1
Pennsylvania:				Alabama:			
Philadelphia	0	0	1	Birmingham	0	0	1
Pittsburgh	0	1	0	Mobile	0	0	1
Illinois:				Arkansas:			
Chicago	0	0	2	Little Rock	0	0	1
Michigan:				Louisiana:			
Detroit	1	1	0	Shreveport	0	1	0
Iowa:				Texas:			
Waterloo	1	0	0	Dallas	0	0	1
North Dakota:							
Fargo	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: Rochester, 1.
Pellagra.—Cases: Boston, 2; Atlanta, 2; Savannah, 3.
Typhus fever.—Cases: New York, 1; Norfolk, 1; Charleston, S. C., 1; Atlanta, 1; Savannah, 1; Miami, 1; Tampa, 2; Nashville, 6; Mobile, 1; Houston, 1.

Rates (annual basis) per 100,000 population for a group of 90 selected cities (population, 1940, 33,929,112)

Period	Diphtheria cases	Influenza Cases	Influenza Deaths	Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases
Week ended Dec. 6, 1941	16.14	31.20	4.30	103.73	58.09	132.17	0.31	47.18	3.38	194.71
Average for week, 1936-40	21.90	105.94	6.83	176.14	84.34	156.26	1.86	50.79	3.88	176.61

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 22, 1941.—During the week ended November 22, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1	1	6	6			1	1	16
Chickenpox		19		271	513	62	95	23	131	1,114
Diphtheria	4	18	1	38		6	3			70
Dysentery				2						2
Influenza		21							23	44
Measles		3		267	135	12	15	1	7	440
Mumps				396	220	63	45	18	92	834
Pneumonia	2	4			11				4	21
Poliomyelitis		2	4		4		1	2		13
Scarlet fever	1	17	11	130	284	21	15	21	8	508
Tuberculosis		4	3	89	43		20			159
Typhoid and paratyphoid fever	1	1		20	3				1	26
Whooping cough		56	2	163	158	2	1		30	412

DENMARK

Notifiable diseases—July–September 1941.—During the months of July, August, and September 1941, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	July	August	September
Cerebrospinal meningitis	16	5	10
Chickenpox	1,194	552	498
Diphtheria	63	55	66
Dysentery	202	416	284
Epidemic encephalitis	2	7	5
Erysipelas	202	227	271
Gastroenteritis	13,519	32,440	11,176
German measles	1,827	503	287
Gonorrhea	963	1,088	1,001
Influenza	2,079	2,556	3,842
Measles	3,709	1,628	1,809
Mumps	438	474	864
Paratyphoid fever	11	12	9
Poliomyelitis	17	144	171
Puerperal fever	16	17	17
Scarlet fever	410	511	998
Syphilis	40	46	58
Tetanus, neonatorum	2	4	2
Typhoid fever	5	10	14
Undulant fever	30	31	26
Weil's disease	1	2	1
Whooping cough	4,039	5,047	4,719

NEW ZEALAND

Vital statistics—Year 1939.—Following are vital statistics for New Zealand for the year 1939:

	Number	Rate per 10,000 inhabitants
Live births	28,833	[1] 18.73
Deaths	14,158	[1] 9.20
Stillbirths	900	[2] 30.27
Infant mortality	898	[3] 31.14
Deaths from:		
Apoplexy	888	5.77
Appendicitis	106	.69
Bright's disease	534	3.47
Bronchitis	210	1.36
Cancer	1,815	11.79
Diabetes	344	2.23
Diarrhea and enteritis	70	.45
Diphtheria	24	.16
Diseases and accidents of childbirth	105	.68
Diseases of the arteries	532	3.46
Deaths from:—Continued.		
Heart disease	4,279	27.80
Hernia and intestinal obstruction	108	.70
Influenza	170	1.10
Measles	8	.05
Pneumonia	311	2.02
Scarlet fever	2	.01
Senility	333	2.16
Tuberculosis	613	3.98
Typhoid and paratyphoid fever	4	.02
Violence	881	5.72
Whooping cough	2	.01

[1] Per 1,000 population. [2] Per 1,000 total births. [3] Per 1,000 live births.

SWEDEN

Notifiable diseases—September 1941.—During the month of September 1941, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases
Cerebrospinal meningitis	6
Diphtheria	14
Dysentery	102
Epidemic encephalitis	4
Gonorrhea	1,126
Paratyphoid fever	81
Poliomyelitis	156
Scarlet fever	873
Syphilis	25
Typhoid fever	12
Undulant fever	5

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–September 1941	October 1941	November 1941—week ended—				
				1	8	15	22	29
ASIA								
Afghanistan: Southern Province.[1]								
Ceylon	C	2	1					
China:								
Canton	C	464						
Hong Kong	C	1,635	16					
Macao	C	1,182	229	34	12	14	2	
Shanghai	C	731	81	11	10	1		
India	C	73,715	13,871					
Bombay	C	115						
Calcutta	C	1,908	64					
Rangoon	C	116						
India (French)	C	34						
Japan: Taiwan	C	2						

[1] During the week ended Dec. 6, 1941, cholera was reported present in Southern Province, Afghanistan.

PLAGUE

[C indicates cases]

Place		January–September 1941	October 1941	November 1941—week ended— 1	8	15	22	29
AFRICA								
Belgian Congo	C	[1] 28						
British East Africa:								
Kenya	C	447	142					
Uganda	C	122	31					
Egypt: Port Said	C	10						
Madagascar	C	207	22					[2] 19
Morocco	C	2,065	52	6	12	17	10	
Casablanca [3]	C	1		3				
Tunisia: Tunis	C	2						
Union of South Africa	C	88	8					
ASIA								
China:								
Fukien Province.[4]								
Foochow	C	8						
Dutch East Indies:								
Java and Madura	C	435						
West Java	C	322						
India	C	3,500	848					
Calcutta	C	3						
Rangoon	C	9						
Indochina (French)	C	22	2		1			
Palestine: Haifa	C	10			1			
Plague-infected rats		25						
Thailand: Lampang Province	C	2						
EUROPE								
Portugal: Azores Islands	C	2						
NORTH AMERICA								
Canada—Alberta—Plague-infected ground squirrel		1						
SOUTH AMERICA								
Argentina:								
Cordoba Province	C	[5] 21						
Santa Fe Province—Plague-infected rats		67						
Brazil:								
Alagoas State	C	33	3					
Bahia State	C	8	2					
Pernambuco State	C	64	6					
Rio de Janeiro State	C	2						
Chile: Valparaiso	C		1					
Ecuador	C	33						
Peru:								
Ancash Department	C	1						
Lambayeque Department	C	3						
Libertad Department	C	7						
Lima Department	C	10	5					
Moquegua Department—Ilo	C	7						
Piura Department	C	2						
OCEANIA								
Hawaii Territory.[6] Plague-infected rats		52	2		1		2	
New Caledonia	C	9					2	

[1] Includes 21 cases of pneumonic plague.
[2] For the month of November.
[3] A report dated June 23, 1941, stated that an outbreak of plague had occurred in Casablanca, Morocco, where several deaths had been reported.
[4] A report dated Nov. 22, 1941, stated that bubonic plague had appeared in epidemic form in Shaowu and Yangkow, Fukien Province.
[5] Includes 3 cases of pneumonic plague.
[6] During April and May, 4 lots of plague-infected fleas were also reported in Hawaii Territory.

SMALLPOX

[C indicates cases]

Place		January–September 1941	October 1941	November 1941—week ended— 1	8	15	22	29
AFRICA								
Algeria	C	394	154		63			
Angola	C	[1] 29						
Belgian Congo	C	634						
British East Africa	C	30						
Dahomey	C	466	1					
French Guinea	C	45						
Gold Coast	C	1						
Ivory Coast	C	39						
Morocco	C	296						
Nigeria	C	828	28					
Niger Territory	C	267						
Portuguese East Africa	C	9						
Rhodesia: Southern	C	86						
Senegal	C	59	4					
Sierra Leone	C	15						
Sudan (Anglo-Egyptian)	C	7						
Sudan (French)	C	19						
Union of South Africa	C	521	11					
ASIA								
Ceylon	C	114						
China	C	252	4		2	1		
Chosen	C	696						
Dutch East Indies—Bali Island	C	3						
India	C	22,669	1,017					
India (French)	C	9						
India (Portuguese)	C	70						
Indochina (French)	C	1,034	89		17		28	
Iran	C	8						
Iraq	C	1,230	22	1				
Japan	C	200						
Straits Settlements	C	1						
Syria	C	1						
Thailand	C	260	23					
EUROPE								
France	C	1						
Portugal	C	37	2	1		1		
Spain	C	301	50					
Switzerland	C				1			
NORTH AMERICA								
Canada	C	24	1					
Dominican Republic	C	2						
Guatemala	C	5						
Mexico	C	53						
Panama Canal Zone (alastrim)	C	[2] 1						
SOUTH AMERICA								
Bolivia	C	[3] 18						
Brazil	C	[4] 1						
Colombia	C	716						
Paraguay	C	[3] 8						
Peru	C	778						
Uruguay	C	7						
Venezuela (alastrim)	C	207	22					

[1] For June.
[2] For September.
[3] For January, February, and March.
[4] For August.

TYPHUS FEVER

[C indicates cases]

Place		January–September 1941	October 1941	November 1941—week ended— 1	8	15	22	29
AFRICA								
Algeria	C	9,757	326		130			
British East Africa: Kenya	C	5	1					
Egypt	C	[1] 8,632						
Morocco	C	884	25	15	36	41	48	
Sierra Leone	C	5						
Tunisia	C	4,958	156	108	125	209		
Union of South Africa	C	333						
ASIA								
China	C	217	20					
Chosen	C	425						
Dutch East Indies: Sumatra	C	136						
India	C	[2] 3	1					
Iran	C	105						
Iraq	C	47	3	1	1		1	
Japan	C	864						
Malaya: Unfederated States	C	1						
Palestine	C	108		4	15			
Straits Settlements	C	7						
Trans-Jordan	C	9						
EUROPE								
Bulgaria	C	224	3					
France (unoccupied zone)	C	2						
Germany	C	1,706	65	8	23			
Gibraltar	C	2						
Greece	C	7						
Hungary	C	408	25	8				
Irish Free State	C	26						
Poland	C	937						
Portugal	C	5						
Rumania	C	761	31		23	65	63	176
Spain	C	9,078	97	31				
Switzerland	C	5						
Turkey	C	645						
Yugoslavia	C	78						
NORTH AMERICA								
Guatemala	C	157	11					
Mexico	C	151						
Panama Canal Zone	C	3						
Puerto Rico	C	4	4			1		
SOUTH AMERICA								
Bolivia	C	[3] 75						
Brazil	C	1						
Chile	C	217						
Colombia	C	1						
Ecuador	C	119						
Peru	C	1,079						
Venezuela	C	42	3					
OCEANIA								
Australia	C	12						
Hawaii Territory	C	34	13	2		3		

[1] Jan. 1 to Nov. 1.
[2] For September.
[3] For January, February, and March.

YELLOW FEVER

[C indicates cases; D, deaths]

Place		January–September 1941	October 1941	November 1941—week ended—				
				1	8	15	22	29
AFRICA								
Belgian Congo:[1]								
Kimvulu	C	1						
Libenge	C	1						
Stanleyville	D			[2]1				
British East Africa: Uganda	C	1						
French Equatorial Africa:								
Gabon	C	2						
Mayumba	C	4						
French Guinea	C			1	1	[2]1		
French West Africa	C				[3]5			
Gold Coast	C	2	1		[2]1			
Accra	C	1						
Ivory Coast [4]	C	[5]6	1				[2]1	
Nigeria	C	[2]1						
Spanish Guinea	D	4						
Sudan (French)[6]	C			[5]5	[7]4		1	
SOUTH AMERICA[8]								
Brazil:								
Amazonas State	D	3						
Bahia State	D	2						
Para State	D	7	1					
Colombia:								
Antioquia Department	D	2						
Boyaca Department	D	8						
Intendencia of Meta	D	8		1	1			
Santander Department	D	14	3	1				
Tolima Department	D	1						
Peru: Junin Department	C	5						
Venezuela: Bolivar State	C	1						

[1] During the week ended Dec. 13, 1 suspected case of yellow fever was reported in Aba, Belgian Congo.
[2] Suspected.
[3] For the period Nov. 1–10, 1941.
[4] During the week ended Dec. 6, 1 suspected case of yellow fever was reported in Abengourou, Ivory Coast.
[5] Includes 2 suspected cases.
[6] During the week ended Dec. 6, 1 death from suspected yellow fever was reported in Sama, French Sudan.
[7] Includes 1 suspected case.
[8] All yellow fever reported in South America is of the jungle type unless otherwise specified.

ANTHRACO-SILICOSIS AMONG SOFT COAL MINERS[1]

A Review

Public Health Bulletin No. 270, "Soft Coal Miners—Health and Working Environment," which was recently issued reports the presence of anthraco-silicosis among a group of bituminous coal mine workers in Utah. A previous Bulletin, No. 221, described anthraco-silicosis among hard coal miners. The present study is part of an investigation of the health and working environment of industrial workers in Utah, made with the cooperation of agencies such as the State Industrial Commission, the State Board of Health, industrial organizations, and labor groups.

Occupational and medical histories were taken, and physical and roentgenological examinations and standard laboratory tests of blood and urine were made on 545 bituminous coal mine workers. Engineering studies included examinations as to the nature and concentration of various types of dust, especially with regard to total silica and free silica, to which workers were exposed. Also studies of ventilation, humidity, and exposure to various gases were carried out.

Studies of the working environment indicated that the dustiest operations were at the face and were associated with the underground occupations of hand loading, undercutting, rock dusting, and drilling. The weighted average dust exposure of workers in these occupations, on the basis of millions of dust particles per cubic foot of air, was 38, 34, 34, and 26, respectively. When all occupations were considered, irrespective of location of work, it was found that only 24 percent of the workers were exposed to more than 30 million particles per cubic foot of air. The majority of the workers (59 percent) were exposed to concentrations varying from 5 to 29 million particles, while the remaining 17 percent had a dust exposure of less than 5 million particles. Ventilation studies showed that although each mine was supplied with air much in excess of the 150 cubic feet per minute per man required by State law, more than half of the working faces had air velocities of less than 40 feet per minute. In some work places the air movement was practically zero. Dry-bulb temperatures in the mines were found to be fairly constant, averaging 60° F., while the relative humidity averaged 85 percent, with considerable variation. The results of gas analyses of mine air indicated that carbon dioxide, oxygen, and nitrogen did not vary greatly from the usual concentrations found in the general outdoor atmosphere. Carbon monoxide

[1] Soft Coal Miners—Health and Working Environment. By R. H. Flinn, H. E. Seifert, H. P. Brinton, J. L. Jones and R. W. Franks. With a chapter on the physiological response of peritoneal tissue by J. W. Miller. Public Health Bulletin No. 270. Government Printing Office, 1941. For sale by the Superintendent of Documents, Washington, D. C. Price 25 cents.

occurred only in samples taken after blasting and was quickly dissipated. Face workers were found to be inhaling dusts containing small amounts (less than 12 percent) of free silica in the form of quartz. Measurements of dust particles indicated that practically all of the dust suspended in the atmosphere of these mines was of a size capable of entering the lung tissue.

The medical study revealed that anthraco-silicosis, a modified form of silicosis due to breathing siliceous dust intermixed with large amounts of carbon dust, was the principal occupational disease found among 507 workers whose only experience in dusty trades had been in bituminous coal mines. The diagnosis of anthraco-silicosis was based upon characteristic X-ray findings, symptoms and physical findings, and a history of several years' employment in bituminous coal mines. It is generally believed that silica must be present in the atmospheric dust which reaches the breathing zone in order to produce disabling pulmonary fibrosis. The free silica exposure of the men in this study is thought to have resulted from rock work, the handling of coal containing bone, rock dusting, and from the dispersion of fine sand in the haulageways. Sixteen (3.2 percent) bituminous coal mine workers were found to have anthraco-silicosis, one with moderate disability and 15 with but slight disability. Anthraco-silicosis was found only in workers who had been employed principally underground, no case being found among tipple or other surface workers. Thirteen cases occurred among men working at the face and three cases occurred among transportation workers. The incidence of anthraco-silicosis increased with increasing weighted average dust concentrations and increasing durations of employment. No case of anthraco-silicosis was found among workers with less than 10 years of employment in bituminous coal mines, and only 2 cases were found among workers with average weighted dust exposures of less than 20 million particles per cubic foot of air. In dust concentration groups above this level, duration of employment was of importance since the incidence of anthraco-silicosis rose from 3.9 percent for those employed from 10 to 19 years to 11.1 percent for those employed from 20 to 29 years, to 20 percent for the 12 persons employed 30 or more years.

Pulmonary tuberculosis seemed to be of minor importance in the group of 507 bituminous coal mine workers since only 3 cases were found showing clinical evidence of activity, all minimal, and 10 workers showed X-ray evidence of apparently healed, minimal tuberculosis. Only 1 lesion, minimal and healed, was found among the 16 persons with anthraco-silicosis.

Recommendations included the use of wet methods in coal mining and processing operations and the adequate ventilation of all work

places. Preemployment physical examinations and annual medical examinations were suggested which included an X-ray film of the chest. It was recommended that no worker be removed from his usual employment because of a diagnosis of simple anthraco-silicosis, but rather the atmospheric dust should be brought within safe limits. However, workers showing evidence of active tuberculosis should be removed from a dusty industry and placed under medical care.

×

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

E. R. COFFEY, *Assistant Surgeon General, Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements, should be addressed to the Surgeon General, United States Public Health Service, Washington, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C.

Price 5 cents. Subscription price $2.50 a year